

iSCSI-to-SATA II RAID Subsystem

User Manual

Revision 1.0

P/N: PW0020000000374

Table of Contents

Chapter 1 Introduction.....	4
1.1 Key Features.....	5
1.2 Technical Specifications.....	6
1.3 Terminology	7
1.4 RAID Concepts	9
1.5 Volume Relationship Diagram	14
Chapter 2 Getting Started	15
2.1 Packaging, Shipment and Delivery	15
2.2 Unpacking the Subsystem.....	15
2.3 Identifying Parts of the iSCSI RAID Subsystem	16
2.3.1 Front View	16
2.3.2 Rear View.....	19
2.4 Connecting the iSCSI RAID Subsystem to Your Network.....	20
2.5 Powering On	20
2.6 Installing Hard Drives.....	21
2.7 iSCSI Introduction	22
2.8 Management Methods.....	24
2.8.1 Web GUI.....	24
2.8.2 Serial Monitor Port	25
2.8.3 Remote Control – Secure Shell	25
2.9 Enclosure.....	26
2.9.1 LCD Control Module (LCM)	26
2.9.2 System Buzzer.....	29
Chapter 3 Configuration via Web GUI	30
3.1 iSCSI RAID Subsystem Web GUI Hierarchy.....	30
3.2 Login.....	31
3.2.1 Language	32
3.2.2 Status Indicators	33
3.3 Quick Install.....	34
3.4 System Configuration.....	35
3.4.1 System Setting.....	36
3.4.2 IP Address	37
3.4.3 Login Setting.....	38
3.4.4 Mail Setting	39
3.4.5 Notification Setting	40

3.5	iSCSI Config.....	42
3.5.1	Entity Property.....	42
3.5.2	NIC.....	43
3.5.3	Node.....	44
3.5.4	Session.....	45
3.5.5	CHAP Account.....	46
3.6	Volume Configuration.....	47
3.6.1	Volume Create Wizard.....	48
3.6.2	Physical Disk.....	50
3.6.3	RAID Group.....	53
3.6.4	Virtual Disk.....	56
3.6.5	Logical Unit.....	59
3.6.6	Example.....	60
3.7	Enclosure Management.....	65
3.7.1	SES Configuration.....	66
3.7.2	Hardware Monitor.....	67
3.7.3	Hard Drive S.M.A.R.T. Function.....	68
3.7.4	UPS.....	69
3.8	System Maintenance.....	70
3.8.1	System Information.....	70
3.8.2	Upgrade.....	71
3.8.3	Reset to Default.....	71
3.8.4	Config Import & Export.....	72
3.8.5	Event Log.....	73
3.8.6	Reboot and Shutdown.....	74
3.9	Logout.....	74
Chapter 4	Advanced Operation.....	75
4.1	Rebuild.....	75
4.2	RG Migration.....	77
4.3	VD Extension.....	79
4.5	Disk Roaming.....	80
4.6	Support Microsoft MPIO and MC/S.....	80
Appendix		81
A.	Certification List.....	81
B.	Event Notifications.....	84
C.	Known Issues.....	88
D.	Microsoft iSCSI Initiator.....	89
E.	Installation Steps for Large Volume (Over 2TB).....	93
F.	MPIO and MC/S Setup Instructions.....	97

Chapter 1 Introduction



The iSCSI RAID Subsystem

The iSCSI RAID subsystem is a 5-bay disk array based on hardware RAID configuration. It is an easy-to-use storage system. It is a very cost-effective disk array subsystem with completely integrated high-performance and data-protection capabilities which meet or exceed the highest industry standards, and the best data solution for small or medium business users.

Unparalleled Performance

- Front-end 2 x 1Gb full iSCSI offload
- System architecture provides high data bandwidth with powerful 64-bit RISC RAID processor

Unsurpassed Data Availability

- RAID 6 capability provides the highest level of data protection

Exceptional Manageability, Menu-Driven Front Panel Display

- Management GUI via serial console, SSH, telnet and web
- Event notification via Email and SNMP trap
- Menu-driven LCD front panel display to monitor environmental devices

1.1 Key Features

- Front-end 2 x 1Gigabit ports full iSCSI offload
- Supports iSCSI jumbo frame
- Supports RAID levels 0, 1, 0+1, 3, 5, 6, 10 and JBOD
- Global hot spare disks
- Write-through or write-back cache policy for different application usage
- Supports greater than 2TB per Virtual Disk (LUN)
- RAID level migration
- Online volume expansion
- Configurable RAID stripe size
- Instant RAID volume availability and background initialization
- Volume rebuilding priority adjustment
- Auto volume rebuilding
- Array roaming

1.2 Technical Specifications

Form Factor: Small Desktop Tower	
RAID processor: Intel XScale IOP331 500MHz	Instant RAID volume availability and background initialization support
RAID Level: 0, 1, 0+1, 3, 5, 6, 10 and JBOD	Supports over 2TB per volume
Cache memory: 512MB ~ 1GB DDR333 DIMM supported	Online consistency check
No. of channels (host and drives): 2 and 5	Bad block auto-remapping
Host bus interface: 1Gb/s Ethernet	S.M.A.R.T. support
Drive bus interface: 3Gb/s SATA II	New disk insertion / removal detection
Hot-swap drive trays: Five (5) 1-inch trays	Auto volume rebuild
Host access control: Read-Write & Read-Only	Array roaming
Supports CHAP authentication	Audible alarm
Jumbo frame support	Password protection
Global hot spare disks	UPS connection
Maximum logical volume: up to 255	Power supplies: 270W power supply w/PFC
Maximum host connection: up to 32	Cooling fans: 1
Maximum host clustering: up to 8 for one logical volume	Power requirements: AC 90V ~ 264V full range 7A ~ 4A, 50Hz ~ 60Hz
Online Volume migration	Environmental Relative Humidity: 10% ~ 85% Non-condensing
Online Volume expansion	Operating Temp: 10°C ~ 40°C (50°F ~ 104°F)
Configurable stripe size	Physical Dimensions: 264(H) x 199(W) x 338(D)mm

1.3 Terminology

The document uses the following terms:

RAID	RAID is the abbreviation of “ Redundant Array of Independent Disks ”. There are different RAID levels with different degree of the data protection, data availability, and performance to host environment.
PD	The P hysical D isk belongs to the member disk of one specific RAID group.
RG	Raid Group . A collection of removable media. One RG consists of a set of VDs and owns one RAID level attribute.
VD	Virtual Disk . Each RD could be divided into several VDs. The VDs from one RG have the same RAID level, but may have different volume capacity.
LUN	Logical Unit Number . A logical unit number (LUN) is a unique identifier which enables it to differentiate among separate devices (each one is a logical unit).
GUI	Graphic User Interface .
RAID width, RAID copy, RAID row (RAID cell in one row)	RAID width, copy and row are used to describe one RG. E.g.: 1. One 4-disk RAID 0 volume: RAID width= 4; RAID copy=1; RAID row=1. 2. One 3-way mirroring volume: RAID width=1; RAID copy=3; RAID row=1. 3. One RAID 10 volume over 3 4-disk RAID 1 volume: RAID width=1; RAID copy=4; RAID row=3.
WT	Write-Through cache-write policy. A caching technique in which the completion of a write request is not signaled until data is safely stored in non-volatile media. Each data is synchronized in both data cache and accessed physical disks.
WB	Write-Back cache-write policy. A caching technique in which the completion of a write request is signaled as soon as the data is in cache and actual writing to non-volatile media occurs at a later time. It speeds up system write performance but needs to bear the risk where data may be inconsistent between data cache and the physical disks in one short time interval.
RO	Set the volume to be Read-Only .
DS	Dedicated Spare disks. The spare disks are only used by one specific RG. Others could not use these dedicated spare disks for any rebuilding purpose.

GS	Global Spare disks. GS is shared for rebuilding purpose. If some RGs need to use the global spare disks for rebuilding, they could get the spare disks out from the common spare disks pool for such requirement.
DG	DeGraded mode. Not all of the array's member disks are functioning, but the array is able to respond to application read and write requests to its virtual disks.
SCSI	Small Computer Systems Interface .
iSCSI	Internet Small Computer Systems Interface .
FC	Fibre Channel .
S.M.A.R.T.	Self-Monitoring Analysis and Reporting Technology .
WWN	World Wide Name .
HBA	Host Bus Adapter .
SAF-TE	SCSI Accessed Fault-Tolerant Enclosures .
SES	SCSI Enclosure Services .
NIC	Network Interface Card .
MPIO	Multi-Path Input/Output .
MC/S	Multiple Connections per Session
MTU	Maximum Transmission Unit .
CHAP	Challenge Handshake Authentication Protocol . An optional security mechanism to control access to an iSCSI storage system over the iSCSI data ports.
iSNS	Internet Storage Name Service .

1.4 RAID Concepts

RAID Fundamentals

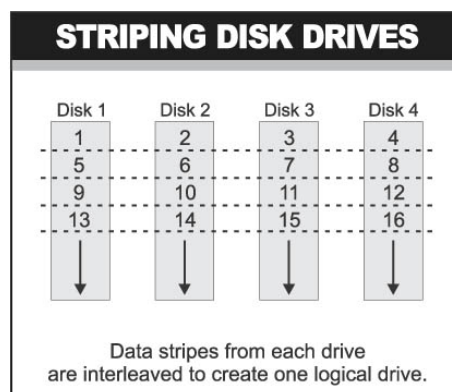
The basic idea of RAID (Redundant Array of Independent Disks) is to combine multiple inexpensive disk drives into an array of disk drives to obtain performance, capacity and reliability that exceeds that of a single large drive. The array of drives appears to the host computer as a single logical drive.

Five types of array architectures, RAID 1 through RAID 5, were originally defined; each provides disk fault-tolerance with different compromises in features and performance. In addition to these five redundant array architectures, it has become popular to refer to a non-redundant array of disk drives as a RAID 0 arrays.

Disk Striping

Fundamental to RAID technology is striping. This is a method of combining multiple drives into one logical storage unit. Striping partitions the storage space of each drive into stripes, which can be as small as one sector (512 bytes) or as large as several megabytes. These stripes are then interleaved in a rotating sequence, so that the combined space is composed alternately of stripes from each drive. The specific type of operating environment determines whether large or small stripes should be used.

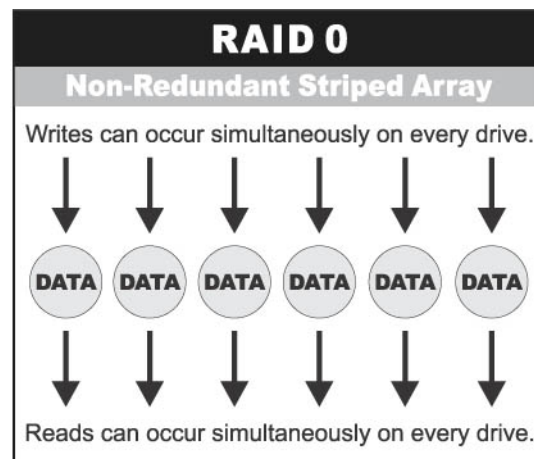
Most operating systems today support concurrent disk I/O operations across multiple drives. However, in order to maximize throughput for the disk subsystem, the I/O load must be balanced across all the drives so that each drive can be kept busy as much as possible. In a multiple drive system without striping, the disk I/O load is never perfectly balanced. Some drives will contain data files that are frequently accessed and some drives will rarely be accessed.



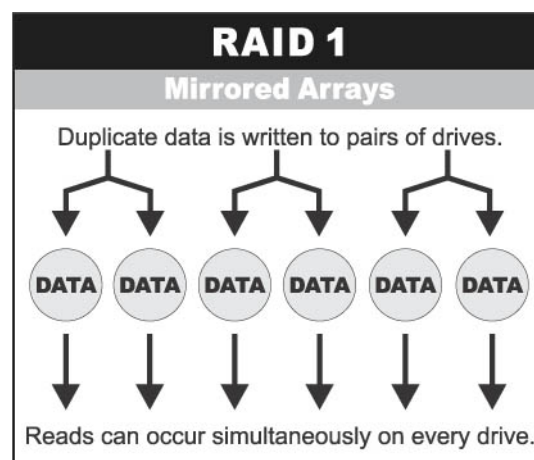
By striping the drives in the array with stripes large enough so that each record falls entirely within one stripe, most records can be evenly distributed across all drives. This keeps all drives in the array busy during heavy load situations. This situation allows all drives to work concurrently on different I/O operations, and thus maximize the number of simultaneous I/O operations that can be performed by the array.

Definition of RAID Levels

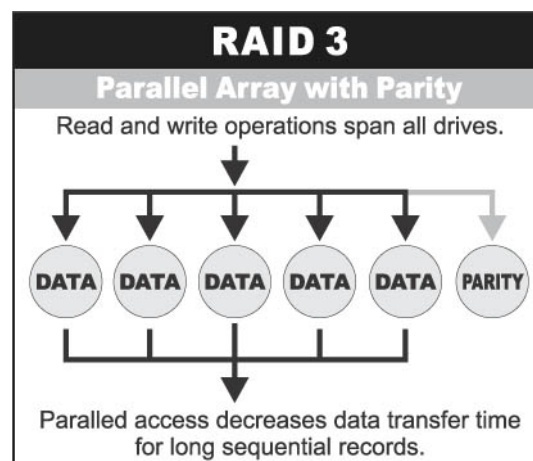
RAID 0 is typically defined as a group of striped disk drives without parity or data redundancy. RAID 0 arrays can be configured with large stripes for multi-user environments or small stripes for single-user systems that access long sequential records. RAID 0 arrays deliver the best data storage efficiency and performance of any array type. The disadvantage is that if one drive in a RAID 0 array fails, the entire array fails.



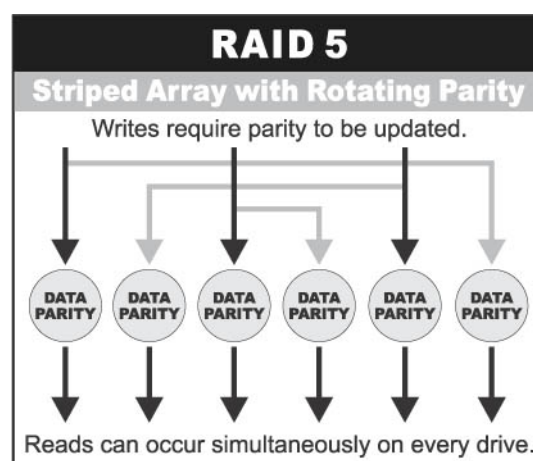
RAID 1, also known as disk mirroring, is simply a pair of disk drives that store duplicate data but appear to the computer as a single drive. Although striping is not used within a single mirrored drive pair, multiple RAID 1 arrays can be striped together to create a single large array consisting of pairs of mirrored drives. All writes must go to both drives of a mirrored pair so that the information on the drives is kept identical. However, each individual drive can perform simultaneous, independent read operations. Mirroring thus doubles the read performance of a single non-mirrored drive and while the write performance is unchanged. RAID 1 delivers the best performance of any redundant array type. In addition, there is less performance degradation during drive failure than in RAID 5 arrays.



RAID 3 sector-stripes data across groups of drives, but one drive in the group is dedicated to storing parity information. RAID 3 relies on the embedded ECC in each sector for error detection. In the case of drive failure, data recovery is accomplished by calculating the exclusive OR (XOR) of the information recorded on the remaining drives. Records typically span all drives, which optimizes the disk transfer rate. Because each I/O request accesses every drive in the array, RAID 3 arrays can satisfy only one I/O request at a time. RAID 3 delivers the best performance for single-user, single-tasking environments with long records. Synchronized-spindle drives are required for RAID 3 arrays in order to avoid performance degradation with short records. RAID 5 arrays with small stripes can yield similar performance to RAID 3 arrays.

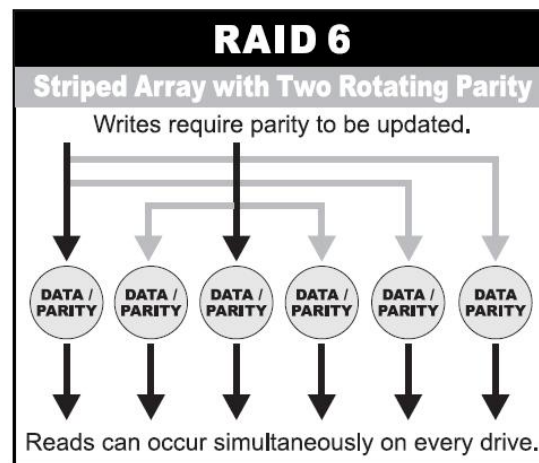


Under **RAID 5** parity information is distributed across all the drives. Since there is no dedicated parity drive, all drives contain data and read operations can be overlapped on every drive in the array. Write operations will typically access one data drive and one parity drive. However, because different records store their parity on different drives, write operations can usually be overlapped.



Dual-level RAID achieves a balance between the increased data availability inherent in RAID 1 and RAID 5 and the increased read performance inherent in disk striping (RAID 0). These arrays are sometimes referred to as RAID 0+1 or RAID 10 and RAID 0+5 or RAID 50.

RAID 6 is similar to RAID 5 in that data protection is achieved by writing parity information to the physical drives in the array. With RAID 6, however, **two** sets of parity data are used. These two sets are different, and each set occupies a capacity equivalent to that of one of the constituent drives. The main advantage of RAID 6 is High data availability – any two drives can fail without loss of critical data.



In summary:

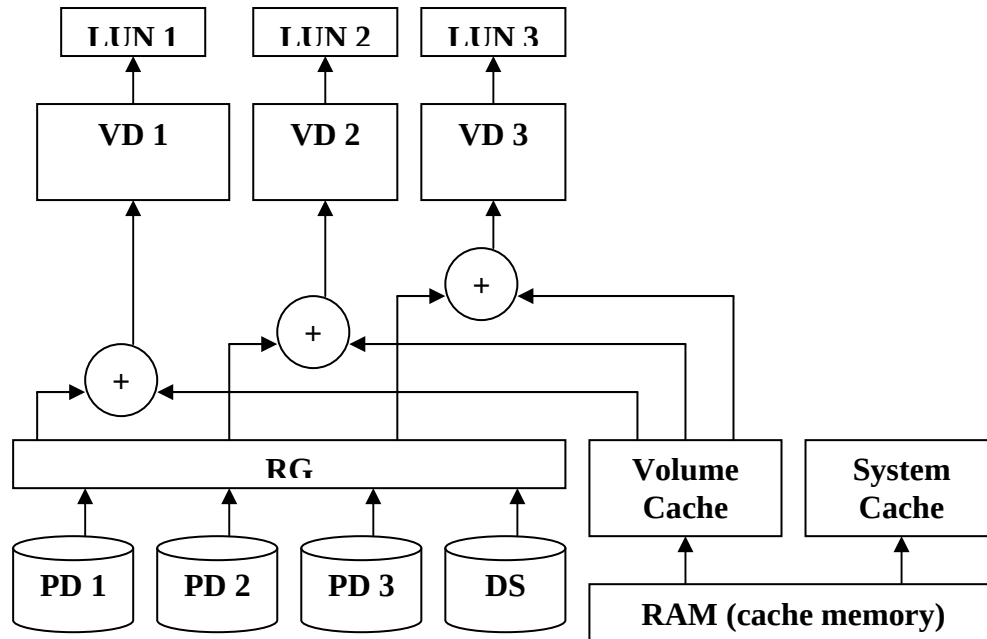
- RAID 0 is the fastest and most efficient array type but offers no fault-tolerance. RAID 0 requires a minimum of one drive.
- RAID 1 is the best choice for performance-critical, fault-tolerant environments. RAID 1 is the only choice for fault-tolerance if no more than two drives are used.
- RAID 3 can be used to speed up data transfer and provide fault-tolerance in single-user environments that access long sequential records. However, RAID 3 does not allow overlapping of multiple I/O operations and requires synchronized-spindle drives to avoid performance degradation with short records. RAID 5 with a small stripe size offers similar performance.
- RAID 5 combines efficient, fault-tolerant data storage with good performance characteristics. However, write performance and performance during drive failure is slower than with RAID 1. Rebuild operations also require more time than with RAID 1 because parity information is also reconstructed. At least three drives are required for RAID 5 arrays.
- RAID 6 is essentially an extension of RAID level 5 which allows for additional fault tolerance by using a second independent distributed parity scheme (two-dimensional parity). Data is striped on a block level across a set of drives, just like in RAID 5, and a second set of parity is calculated and written across all the drives; RAID 6 provides for an extremely high data fault tolerance and can sustain multiple simultaneous drive failures. It is a perfect solution for mission critical applications.

RAID Management

The subsystem can implement several different levels of RAID technology. RAID levels supported by the subsystem are shown below.

RAID Level	Description	Min. Drives
0	Block striping is provide, which yields higher performance than with individual drives. There is no redundancy.	1
1	Drives are paired and mirrored. All data is 100 % duplicated on an equivalent drive. Fully redundant.	2
N-way mirror	Extension of RAID 1 level. It has N copies of the disk.	N
3	Data is striped across several physical drives. Parity protection is used for data redundancy.	3
5	Data is striped across several physical drives. Parity protection is used for data redundancy.	3
6	Data is striped across several physical drives. Parity protection is used for data redundancy. Requires N+2 drives to implement because of two-dimensional parity scheme	4
0 + 1	Mirroring of the two RAID 0 disk arrays. This level provides striping and redundancy through mirroring.	4
10	Striping over the two RAID 1 disk arrays. This level provides mirroring and redundancy through striping.	4
JBOD	The abbreviation of “Just a Bunch Of Disks”. JBOD needs at least one hard drive.	1

1.5 Volume Relationship Diagram



This diagram shows how the volume structure of the iSCSI RAID subsystem is designed. It describes the relationship of RAID components. One RG (RAID group) consists of a set of VDs (Virtual disk) and owns one RAID level attribute. Each RG can be divided into several VDs. The VDs in one RG share the same RAID level, but may have different volume capacity. Each VD will be associated with the Volume Cache (portion of cache memory) to execute the data transaction. LUN (Logical Unit Number) is a unique identifier assigned to every VD, and users access the LUN through SCSI commands.

Chapter 2 Getting Started

2.1 Packaging, Shipment and Delivery

- ❖ Before removing the subsystem from the shipping carton, you should visually inspect the physical condition of the shipping carton.
- ❖ Unpack and verify that the contents of the shipping carton are complete and in good condition.
- ❖ Exterior damage to the shipping carton may indicate that the contents of the carton are damaged.
- ❖ If any damage is found, do not remove the components; contact the dealer where you purchased the subsystem for further instructions.

2.2 Unpacking the Subsystem

The package contains the following items:

- iSCSI RAID subsystem unit
- One power cord
- Three Ethernet LAN cables
- One RS232 null modem cable (phone jack to DB9)
- One UPS cable (phone jack to DB9)
- Installation Reference Guide
- Spare screws, etc.

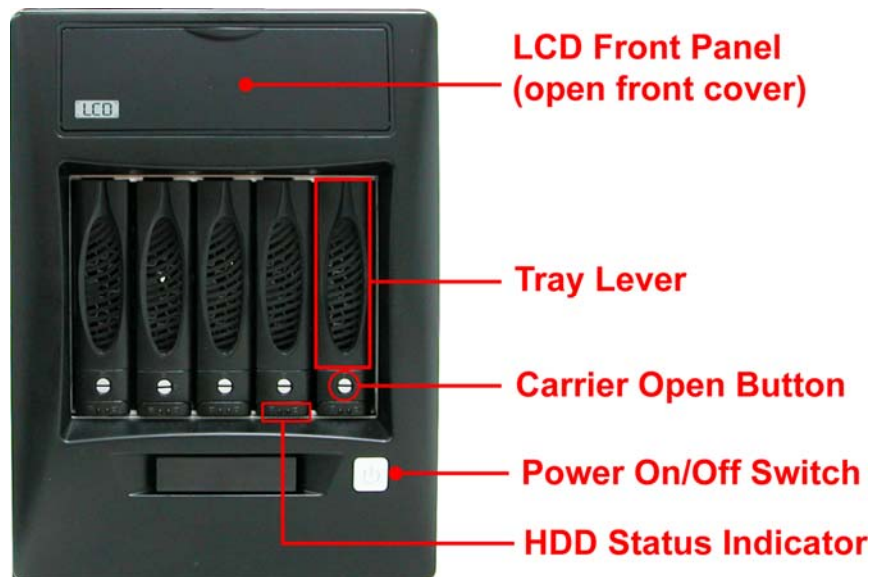


If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.

2.3 Identifying Parts of the iSCSI RAID Subsystem

The illustrations below identify the various parts of the subsystem.

2.3.1 Front View



Power On/Off Switch

Use this to power on or power off the subsystem.

Carrier Open Button

Use this to open the disk tray. Press the button to open. This button also shows the Lock Indicator.

When the Lock Groove is vertical, this indicates that the Drive Tray is locked. When the Lock Groove is horizontal, the Drive Tray is unlocked. Lock and unlock the Drive Trays by using a flat-head screw driver.

Tray Lever – Use this to pull out the disk tray.

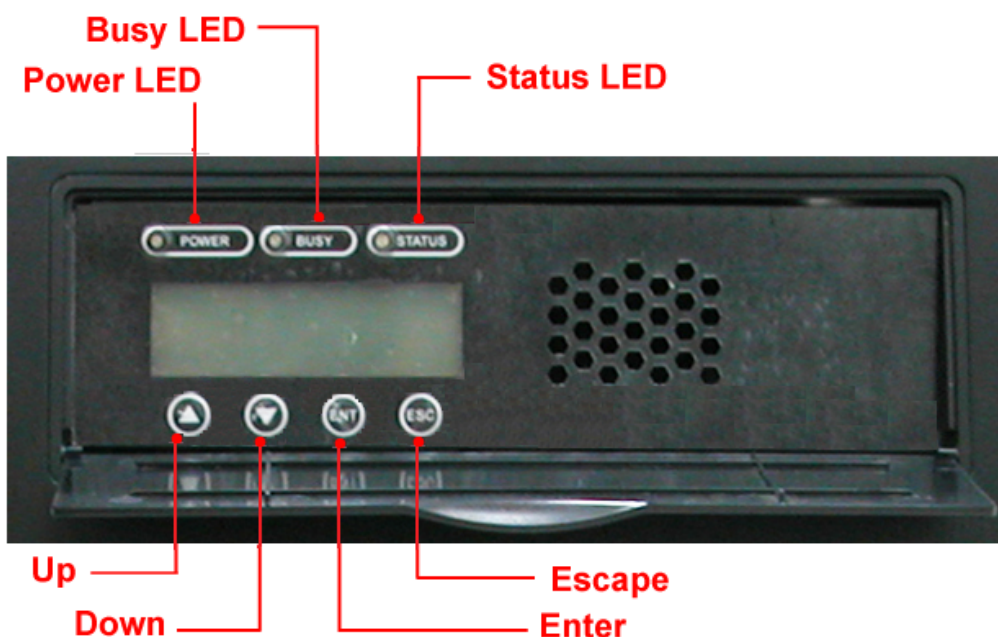
HDD Status Indicator

Every Drive Tray contains two LEDs for displaying the HDD status.

Parts	Function
HDD Status LED	Green LED indicates power is on and hard drive status is good for this slot. Red LED indicates no hard drive.
HDD Access LED	LED will blink blue when the hard drive is busy or is being accessed.

LCD Front Panel

The LCD Front Panel has a front cover. Open the front cover to access the LCD Front Panel.



Power LED

Green LED indicates power is on.

Busy LED

This LED will be blinking Green when the RAID subsystem is busy or data is being accessed.

Status LED

This LED will become Orange (amber) when there is abnormal condition in the RAID subsystem, such as when a RAID is degraded or failed.

LCD Display

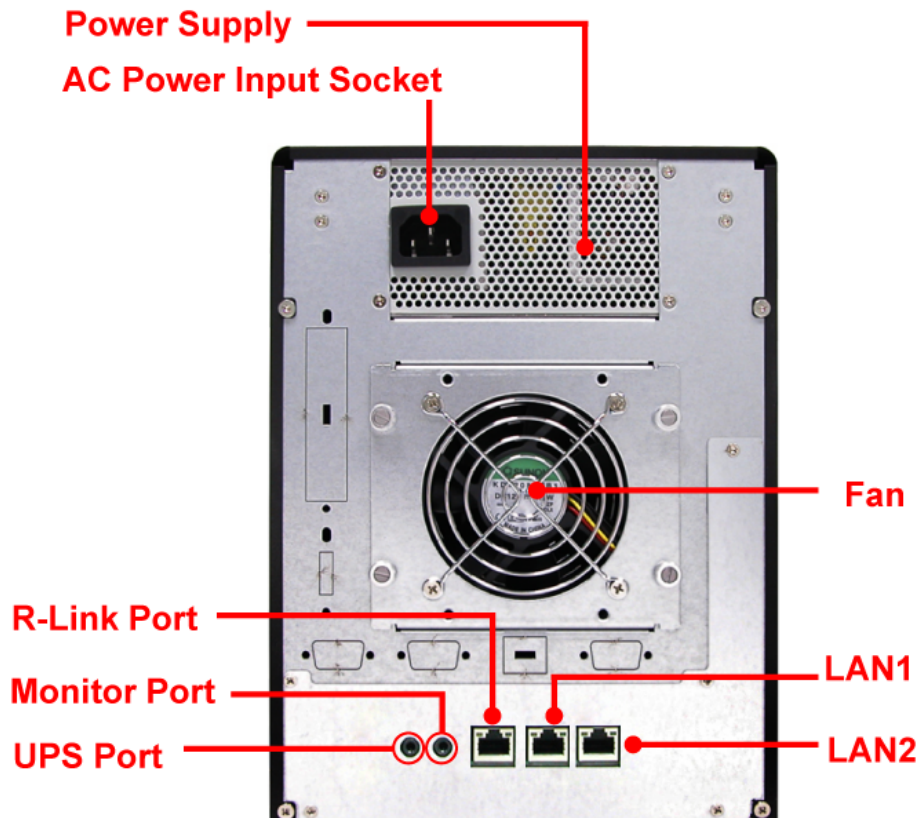
This displays the current IP address and the model name or the iSCSI RAID subsystem.

LCD Control Module (LCM)

Use the function keys to navigate through the menu options available in the LCM.

Parts	Function
Up and Down buttons 	Use the Up or Down buttons to go through the information on the LCD screen. This is also used to move between each menu when you configure the subsystem.
Enter button ENT	This is used to enter the option you have selected.
Escape button ESC	Press this button to return to the previous menu.

2.3.2 Rear View



Uninterruptible Power Supply (UPS) Port (APC Smart UPS only)

The subsystem has an optional UPS port allowing you to connect an APC Smart UPS device. Connect the UPS cable from the UPS device to the UPS port located at the rear of the subsystem. This will automatically allow the subsystem to use the functions and features of the UPS.

Monitor Port

The subsystem is equipped with an RS232 serial port allowing you to connect a PC or terminal using the null modem cable (phone-jack to DB9).

R-Link Port: Remote Link through RJ-45 Ethernet for remote management

The subsystem is equipped with one 10/100 Ethernet RJ45 LAN port. Use web browser to remotely manage, monitor or configure the RAID subsystem.

LAN1 / LAN2 Ports

The subsystem is equipped with two 1Gigabit data ports for connecting to the network.

Fan

One cooling fan is located at the rear of the subsystem. It provides sufficient airflow and heat dispersion inside the chassis. In case a fan fails to function, the Status LED will turn red and an alarm will sound.

2.4 Connecting the iSCSI RAID Subsystem to Your Network

To connect the iSCSI unit to the network, insert the cable that came with the unit into the Gigabit network port (LAN1) on the back of iSCSI unit. Insert the other end into a Gigabit BASE-T Ethernet connection on your network hub or switch. You may connect the other network port LAN2 if needed.

For remote management of the iSCSI RAID subsystem, connect the R-Link port to your network.

2.5 Powering On

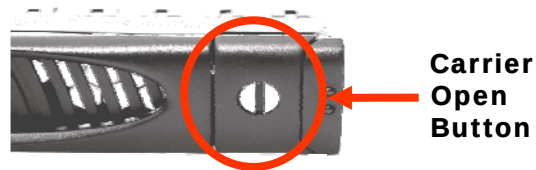
1. Plug in the power cord into the AC Power Input Socket located at the rear of the subsystem.
2. Press the Power On/Off Switch.
3. The Power LED on the front Panel will turn green.

2.6 Installing Hard Drives

The iSCSI RAID subsystem supports hot-swapping allowing you to install or replace a hard drive while the subsystem is running.

Each Drive Carrier has a locking mechanism. When the Lock Groove is vertical, this indicates that the Drive Carrier is locked. When the Lock Groove is horizontal, the Drive Carrier is unlocked. Lock and unlock the Drive Carriers by using a flat-head screw driver. The Lock Grooves are located on the carrier open button.

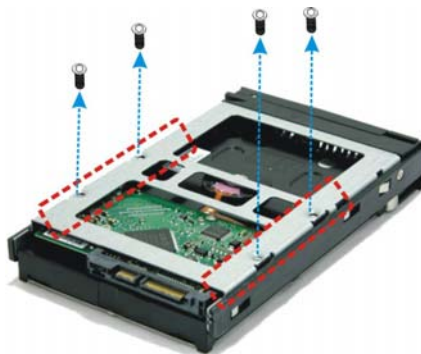
- a. Press the Carrier Open Button and the drive carrier handle will flip open.



- b. Pull out an empty disk tray. Pull the lever handle outwards to remove the carrier from the enclosure.
- c. Place the hard drive in the disk tray. Make sure the holes of the disk tray align with the holes of the hard drive.



- d. Install the mounting screws on the bottom part to secure the drive in the disk tray.



- e. Slide the tray into a slot.
- f. Close the lever handle until you hear the latch click into place.

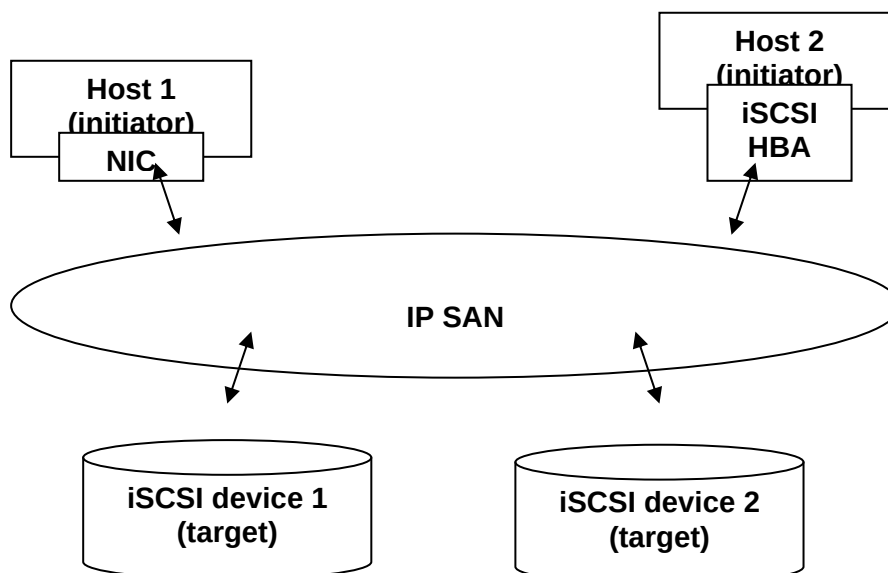
2.7 iSCSI Introduction

iSCSI (Internet SCSI) is a protocol which encapsulates SCSI (Small Computer System Interface) commands and data in TCP/IP packets for linking storage devices with servers over common IP infrastructures. iSCSI provides high performance SANs over standard IP networks like LAN, WAN or the Internet.

IP SANs are true SANs (Storage Area Networks) which allow few of servers to attach to an infinite number of storage volumes by using iSCSI over TCP/IP networks. IP SANs can scale the storage capacity with any type and brand of storage system. In addition, using any type of network (Ethernet, Fast Ethernet, Gigabit Ethernet) and combining operating systems (Microsoft Windows, Linux, Solaris, ...etc.) within the SAN network. IP-SANs also include mechanisms for security, data replication, multi-path and high availability.

Storage protocol, such as iSCSI, has “two ends” in the connection. These ends are the initiator and the target. In iSCSI we call them iSCSI initiator and iSCSI target. The iSCSI initiator requests or initiates any iSCSI communication. It requests all SCSI operations like read or write. An initiator is usually located on the host/server side (either an iSCSI HBA or iSCSI SW initiator).

The iSCSI target is the storage device itself or an appliance which controls and serves volumes or virtual volumes. The target is the device which performs SCSI commands or bridges it to an attached storage device. iSCSI targets can be disks, tapes, RAID arrays, tape libraries, and etc.



The host side needs an iSCSI initiator. The initiator is a driver which handles the SCSI traffic over iSCSI. The initiator can be software or hardware (HBA). Please refer to the certification list of iSCSI HBA(s) in Appendix A. OS native initiators or other software initiators use the standard TCP/IP stack and Ethernet hardware, while iSCSI HBA(s) use their own iSCSI and TCP/IP stacks on board.

Hardware iSCSI HBA(s) would provide its initiator tool. Please refer to the vendors' HBA user manual. **Microsoft**, **Linux** and **Mac** provide software iSCSI initiator driver. Below are the available links:

1. Link to download the Microsoft iSCSI software initiator:

<http://www.microsoft.com/downloads/details.aspx?FamilyID=12cb3c1a-15d6-4585-b385-befd1319f825&DisplayLang=en>

Please refer to Appendix D for Microsoft iSCSI initiator installation procedure.

2. Linux iSCSI initiator is also available. For different kernels, there are different iSCSI drivers. If you need the latest Linux iSCSI initiator, please visit Open-iSCSI project for most update information. Linux-iSCSI (sfnet) and Open-iSCSI projects merged in April 11, 2005.

Open-iSCSI website: <http://www.open-iscsi.org/>

Open-iSCSI README: <http://www.open-iscsi.org/docs/README>

Features: <http://www.open-iscsi.org/cgi-bin/wiki.pl/Roadmap>

Support Kernels: http://www.open-iscsi.org/cgi-bin/wiki.pl/Supported_Kernels

Google groups: <http://groups.google.com/group/open-iscsi/threads?gvc=2>
<http://groups.google.com/group/open-iscsi/topics>

Open-iSCSI Wiki: <http://www.open-iscsi.org/cgi-bin/wiki.pl>

3. ATTO iSCSI initiator is available for Mac.

Website: <http://www.attotech.com/xtend.html>

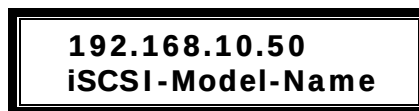
2.8 Management Methods

There are three management methods to manage the iSCSI RAID subsystem, describe in the following:

2.8.1 Web GUI

The iSCSI RAID subsystem supports graphical user interface to manage the system. Be sure to connect LAN cable to your R-Link port. The default setting of management port IP is DHCP and the DHCP address displays on LCD Display; user can check LCD Display for the IP first, then open the browser and type the DHCP address: (The DHCP address is dynamic and user may need to check every time after reboot again.) When DHCP client function is enabled in the iSCSI RAID subsystem, but DHCP server cannot be located or DHCP service is not available, the subsystem uses zero config (Zeroconf) to get an IP address.

Example: On LCD Display, the subsystem gets a DHCP address 192.168.10.50 from DHCP server.



On web browser, type:

<http://192.168.10.50>

or

<https://192.168.10.50> (https: connection with encrypted Secure Sockets Layer (SSL). Please be aware that the https function is slower than http.)

The Login Page will be displayed. Enter a user name and password.

To login as admin with full access control to the subsystem, enter:

Login name: **admin**

Default password: **00000000**

Or login with the **read-only account** which only allows seeing the configuration and cannot change setting.

Login name: **user**

Default password: 1234

2.8.2 Serial Monitor Port

Use NULL modem cable to connect to serial Monitor port.

The serial port setting is baud rate: **115200**, 8 bits, 1 stop bit, and no parity.

Terminal type: **vt100**

Login name: **admin**

Default password: **00000000**

2.8.3 Remote Control – Secure Shell

SSH (secure shell) is required for the iSCSI RAID subsystem to remote login. The SSH client software is available at the following web site:

SSHWinClient WWW: <http://www.ssh.com/>

Putty WWW: <http://www.chiark.greenend.org.uk/>

Host name: **192.168.10.50** (Please check your DHCP address for this field.)

Login name: **admin**

Default password: **00000000**

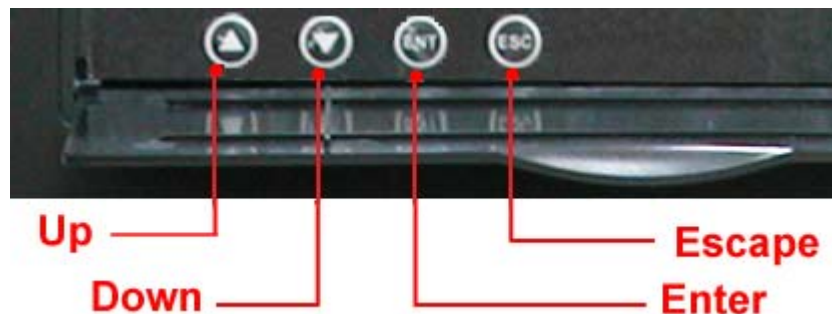


NOTE: The iSCSI RAID series only support SSH for remote control. For using SSH, the IP address and the password is required for login.

2.9 Enclosure

2.9.1 LCD Control Module (LCM)

There are four buttons to control the subsystem LCM (LCD Control Module).



After booting up the subsystem, the LCD Display will show the management port IP (for example: 192.168.10.50 from DHCP server) and iSCSI model name:

192.168.10.50
iSCSI-Model-Name

Press **"ENT"**, the LCM functions **"System Info," "Alarm Mute," "Reset/Shutdown," "Quick Install," "Volume Wizard," "View IP Setting," "Change IP Config"** and **"Reset to Default"** will rotate by pressing **▲** (up) and **▼** (down).

When there is WARNING or ERROR level of event (LCM default filter), the LCM shows the event log to give users event information from LCD front panel too.

The following table details the function description.

System Info	View System information of Firmware Version & RAM Size.
Alarm Mute	Mute alarm when error occurs.
Reset / Shutdown	Reset or shutdown controller.
Quick Install	Quick three steps to create a volume. Please refer to Section 3.3 for operation in web UI.
Volume Wizard	Smart steps to create a volume. Please refer to next chapter for operation in web UI.
View IP Setting	Display current IP address, subnet mask, and gateway.
Change IP Config	Set IP address, subnet mask, and gateway. There are 2 selections, DHCP (Get IP address from DHCP server) or set static IP.
Reset to Default	Reset to default sets password to default: 00000000, and set IP address to default as DHCP setting. Default IP address: 192.168.10.50 (DHCP) Default subnet mask: 255.255.255.0 Default gateway: 192.168.10.254

The following is the LCM menu hierarchy.

proIPS ▲▼	[System Info.]	[Firmware Version]			
		[RAM Size]			
	[Alarm Mute]	[▲Yes No▼]			
	[Reset/Shutdown]	[Reset]	[▲Yes No▼]		
		[Shutdown]	[▲Yes No▼]		
	[Quick Install]	RAID 0 RAID 1 RAID 3 RAID 5 RAID 6 RAID 0+1 xxx GB	[Apply The Config]	[▲ (Yes No▼)]	
	[Volume Wizard]	RAID 0 RAID 1 RAID 3 RAID 5 RAID 6 RAID 0+1	[Use default algorithm]	[Volume Size] xxx GB	[Apply The Config] [▲Yes No▼]
	[View IP Setting]	[IP Config] [Static IP]			
		[IP Address] [192.168.010.050]			
		[IP Subnet Mask] [255.255.255.0]			
		[IP Gateway] [192.168.010.254]			
	[Change IP Config]	[DHCP]	[▲Yes No▼]		
		[Static IP]	[IP Address]	Adjust IP address	
			[IP Subnet Mask]	Adjust Submask IP	
			[IP Gateway]	Adjust Gateway IP	
			[Apply IP Setting]	[▲Yes No▼]	
	[Reset to Default]	[▲Yes No▼]			



WARNING: Before power off, it is better to execute “Shutdown” to flush the data from cache to physical disks.

2.9.2 System Buzzer

The system buzzer features are described as follows:

1. The system buzzer alarms 1 second when system boots up successfully.
2. The system buzzer alarms continuously when an error level event happens. The alarm will be stopped after mute.
3. The alarm will be muted automatically when the error situation is resolved. E.g.: When RAID 5 is degraded, an alarm sounds immediately. After user changes/adds one physical disk for rebuilding, and when the rebuilding is done, the alarm will be muted automatically.

Chapter 3 Configuration via Web GUI

3.1 iSCSI RAID Subsystem Web GUI Hierarchy

The below table is the web GUI hierarchy of the subsystem.

Quick installation	→ Step 1 / Step 2 / Confirm
System configuration	
System setting	→ System name / Date and time
IP address	→ MAC address / Address / DNS / port
Login setting	→ Login configuration / Admin password / User password
Mail setting	→ Mail
Notification setting	→ SNMP / Messenger / System log server / Event log filter
iSCSI configuration	
Entity property	→ Entity name / iSNS IP
NIC	→ IP settings for iSCSI ports / Become default gateway / Enable jumbo frame
Node	→ Create / Authenticate / Rename / User / Delete
Session	→ Session information / Delete
CHAP account	→ Create / Delete
Volume configuration	
Volume create wizard	Step 1 / Step 2 / Step 3 / Step 4 / Confirm
Physical disk	→ Set Free disk / Set Global spare / Set Dedicated spare / Set property / More information
RAID group	→ Create / Migrate / Activate / Deactivate / Scrub / Delete / Set disk property / More information
Virtual disk	→ Create / Extend / Scrub / Delete / Set property / Attach LUN / Detach LUN / List LUN / More information
Logical unit	→ Attach / Detach
Enclosure management	
SES configuration	→ Enable / Disable
Hardware monitor	→ Auto shutdown
S.M.A.R.T.	→ S.M.A.R.T. information
UPS	→ UPS Type / Shutdown battery level / Shutdown delay / Shutdown UPS
Maintenance	
System information	→ System information
Upgrade	→ Browse the firmware to upgrade / Export configuration
Reset to default	→ Sure to reset to factory default?
Import and export	→ Import/Export / Import file
Event log	→ Download / Mute / Clear
Reboot and shutdown	→ Reboot / Shutdown

Logout

Sure to logout?

3.2 Login

The iSCSI RAID subsystem supports graphical user interface (GUI) to manage the subsystem. Be sure to connect the LAN cable to the R-Link port. The default IP setting is **DHCP**; open web browser and enter:

http://192.168.10.50 (Please check the DHCP address first on LCM)

The Login Page will be displayed. Enter a user name and password.

To login as admin with full access control to the subsystem, enter:

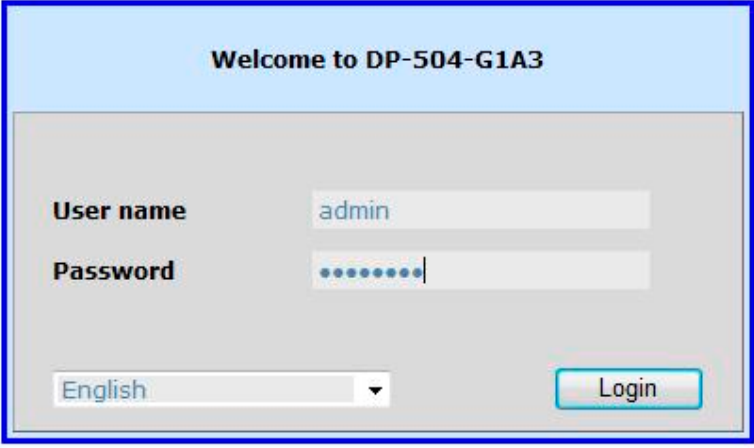
Login name: **admin**

Default password: **00000000**

Or login with the **read-only account** which only allows seeing the configuration and cannot change setting.

Login name: **user**

Default password: 1234



Welcome to DP-504-G1A3

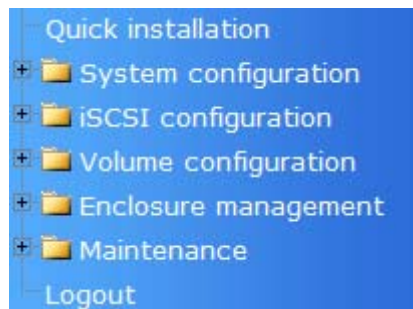
User name: admin

Password:

English

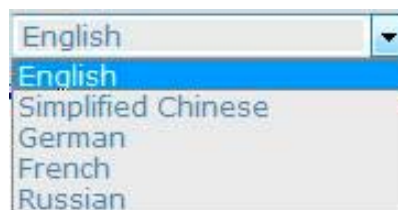
Login

After login, you can choose a menu or function on the left side screen.



3.2.1 Language

Before clicking the Login button, you can change the GUI language if needed. There are 5 options to select: English, Simplified Chinese, German, French, and Russian.



3.2.2 Status Indicators

There are six indicators at the top-right corner.



1.  **RAID light:** Green means RAID works well. Red represents RAID failure happening.
2.  **Temperature light:** Green is normal. Red represents abnormal temperature.
3.  **Voltage light:** Green is normal. Red represents abnormal voltage status.
4.  **UPS light:** Green is normal. Red represents abnormal UPS status.
5.  **Fan light:** Green is normal. Red represents abnormal fan status.
6.  **Power light:** Green is normal. Red represents abnormal power status.

3.3 Quick Install

It is easy to use “**Quick install**” to create a volume. It uses whole physical disks to create a RG. The system will calculate maximum spaces on RAID levels 0/1/3/5/6/0+1. “**Quick install**” will occupy all residual RG space for one VD, and it has no space for spare disk. If spare disk is needed, please create RG and VD manually. If some physical disks are already used in another RG, “**Quick install**” can not be used because the function is valid only when all physical disks in the system are free.

Step 1: Select “**Quick install**” then choose the **RAID level**. After choosing the RAID level, click the **Confirm** button. It will link to another page.

/ Quick installation / Step 1

RAID level :

- RAID 0 (3725 GB) -
- RAID 0 (3725 GB) -
- RAID 1 (931 GB) -
- RAID 3 (2793 GB) -
- RAID 5 (2793 GB) -
- RAID 6 (1862 GB) -
- RAID 0+1 (1862 GB) -

Confirm

Step 2: Confirm page. If all setups are correct, click **Confirm**. Then a newly created VD will be shown.

/ Quick installation / Step 2

RAID level: RAID 0

Volume size (GB) : 3725

<< Back Confirm

You can start to use the system now (connect initiator/host to LUN).

/ Volume configuration / Virtual disk

No.	Name	Size (GB)	Right	Priority	Bg rate	Status	Health	R %	RAID	#LUN	RG name
1	QUICK86938	3725	WB	HI	4	Online	Optimal		RAID 0	1	QUICK53542

Create

In the screenshot above, a RAID 0 RG named “QUICK53542” and a VD named “QUICK86938”, both of which are named by the system itself, has total available size of 3725GB.

3.4 System Configuration

“**System configuration**” is designed for setting up the “**System setting**”, “**IP address**”, “**Login setting**”, “**Mail setting**”, and “**Notification setting**”.

/ System configuration	
System setting	System name for identification System time for event log
IP address	Internet Protocol(IP) address for remote administration
Login setting	Configuration for auto logout and login lock Administrator's password
Mail setting	Alert by e-mail
Notification setting	Alert via Simple Network Management Protocol(SNMP) Transmits net send and alerter service messages between clients and servers Alert to remote system log server

3.4.1 System Setting

Select **“System setting”** to change system name and date. Default system name is the model name, e.g.: DP-504-G1A3.

The screenshot shows a web-based configuration interface for a RAID subsystem. At the top, a blue header bar contains the breadcrumb navigation "/ System configuration / System setting" and five green status indicator lights. Below the header, the interface is divided into two main sections. The first section, titled "System name", contains a label "System name :" followed by a text input field containing the value "DP-504-G1A3". The second section, titled "Date and time", contains several options. At the top of this section is a checkbox labeled "Change date and time". Below it, the "Current time :" is displayed as "2009/5/7 18:11:57". The "Time zone :" is shown as a dropdown menu with the selected value "(GMT+08:00) Taipei". Below these, there are two radio button options. The first is "Setup date and time manually", which is selected. This option includes fields for "Date :" (2009 / 5 / 7) and "Time :" (18 : 11 : 54). The second radio button option is "NTP", which is unselected. Below the NTP option is a "Server :" label followed by an empty text input field. At the bottom right of the interface, there is a "Confirm" button.

Check **“Change date and time”** option to set up the current date, time, and time zone before using, or synchronize time from NTP (Network Time Protocol) server. Click **Confirm** when done.

3.4.2 IP Address

Select **"IP address"** to change the IP address for remote administration usage. There are 2 options, DHCP (Get IP address from DHCP server) or Static (static IP). The default setting is DHCP enabled. User can change the HTTP, HTTPS, and SSH port number when the default port number is not allowed on the host/server.

/ System configuration / IP address	
MAC address	
MAC address :	00:13:78:AE:00:02
Address	
☐	DHCP
☒	Static
Address :	192.168.110.128
Mask :	255.255.255.0
Gateway :	192.168.110.254
DNS	
DNS :	127.0.0.1
Port	
HTTP port :	80
HTTPS port :	443
SSH port :	22

3.4.3 Login Setting

Select **“Login setting”** to set single admin login, set the auto logout timing, and change admin or user password. The single admin login can prevent multiple users to access the same iSCSI RAID system at the same time.

1. **Auto logout:** The options are (1) Disable; (2) 5 minutes; (3) 30 minutes; (4) 1 hour. The system will log out automatically when user is inactive for a period of time.
2. **Login lock:** Disable/Enable. When the login lock is enabled, the system allows only one user to login/modify system settings.

/ System configuration / Login setting

Login configuration

Auto logout :

- Disable - ▼

Login lock :

- Disable - ▼

Admin password

☐ **Change admin password**

Old password :

Password :

Confirm :

User password

☐ **Change user password**

Password :

Confirm :

Check **“Change admin password”** or **“Change user password”** to change admin or user password. The maximum length of password is 12 characters.



NOTE: The default “user” account is a read-only account which is allowed only to view the system configurations.

3.4.4 Mail Setting

Select **“Mail setting”** to enter at most 3 mail addresses for receiving event notifications. Some mail servers would check **“Mail-from address”** and need authentication for anti-spam. Please fill the necessary fields and select **“Send test mail”** to check whether the email works fine. User can also select which levels of event logs are needed to be sent out via Mail. In default settings, only ERROR and WARNING event logs are enabled.

The screenshot shows a web interface for configuring mail settings. The breadcrumb path is "/ System configuration / Mail setting". The page title is "Mail". The configuration fields are as follows:

- Mail-from address :** mailman@DP-504-G1A3
- Mail-to address 1 :** (empty text field)
- Send events 1 :** ☐ INFO ☒ WARNING ☒ ERROR
- Mail-to address 2 :** (empty text field)
- Send events 2 :** ☐ INFO ☒ WARNING ☒ ERROR
- Mail-to address 3 :** (empty text field)
- Send events 3 :** ☐ INFO ☒ WARNING ☒ ERROR
- ☐ **SMTP relay**
 - SMTP server :** (empty text field)
 - Authentication :** None (dropdown menu)
 - Account :** (empty text field)
 - Password :** (empty text field)
 - Confirm :** (empty text field)

At the bottom right, there is a button labeled "Send test mail" with a circular icon.

3.4.5 Notification Setting

You can use “**Notification setting**” to set up SNMP trap for sending alerts via SNMP, pop-up messages via Windows Messenger (not MSN), and alerts via syslog protocol, and set event log filter.

SNMP	
SNMP trap address 1 :	
SNMP trap address 2 :	
SNMP trap address 3 :	
Community :	public
Send events :	☒ INFO ☐ WARNING ☐ ERROR

Messenger	
Messenger IP/Computer name 1 :	
Messenger IP/Computer name 2 :	
Messenger IP/Computer name 3 :	
Send events :	☐ INFO ☒ WARNING ☒ ERROR

System log server	
Server IP/hostname :	
UDP Port :	514
Facility :	User ▼
Event level :	☐ INFO ☒ WARNING ☒ ERROR

Event log filter	
Pop up events :	☐ INFO ☐ WARNING ☐ ERROR
Show on LCM :	☐ INFO ☒ WARNING ☒ ERROR

“**SNMP**” allows up to 3 SNMP trap addresses. Default community is set to “public”. User can choose the event log levels; the default setting only enables INFO event log in SNMP. There are many SNMP tools. Some reference can be found on the following web sites:

SNMPc: <http://www.snmpc.com/>

Net-SNMP: <http://net-snmp.sourceforge.net/>

Using **“Messenger”**, user must enable the service “Messenger” in Windows (Start → Control Panel → Administrative Tools → Services → Messenger), and then event logs can be received. It allows up to 3 messenger addresses. User can choose the event log levels. Note that in default settings, only the WARNING and ERROR event logs are enabled.

Using **“System log server”**, user can choose the facility and the event log level. The default port of syslog is 514. The default setting enables event level: INFO, WARNING and ERROR event logs.

There are some syslog server tools. The refer to the following web sites:

WinSyslog: <http://www.winsyslog.com/>

Kiwi Syslog Daemon: <http://www.kiwisyslog.com/>

Most UNIX systems build in syslog daemon.

“Event log filter” setting can enable event level on “Pop up events” and “LCM”.

3.5 iSCSI Config

“iSCSI config” selection is for the setup of “Entity Property”, “NIC”, “Node”, “Session”, and “CHAP account”.

/ iSCSI configuration	
Entity property	iSCSI entity property
NIC	iSCSI portal configuration
Node	iSCSI node configuration
Session	iSCSI session information
CHAP account	Add/Remove account for iSCSI node

3.5.1 Entity Property

Select “Entity property” to view the entity name of the iSCSI RAID subsystem, and setup “iSNS IP” for iSNS (Internet Storage Name Service) service. iSNS protocol allows automated discovery, management and configuration of iSCSI devices on a TCP/IP network. Using iSNS, it needs to install a iSNS server in SAN. Add an iSNS server IP address to the iSNS servers list which the iSCSI initiator service can send queries.

/ iSCSI configuration / Entity property

Entity name : iqn.1997-05.tw.com.proware:dp-504-g1a3-000ae0074
iSNS IP :

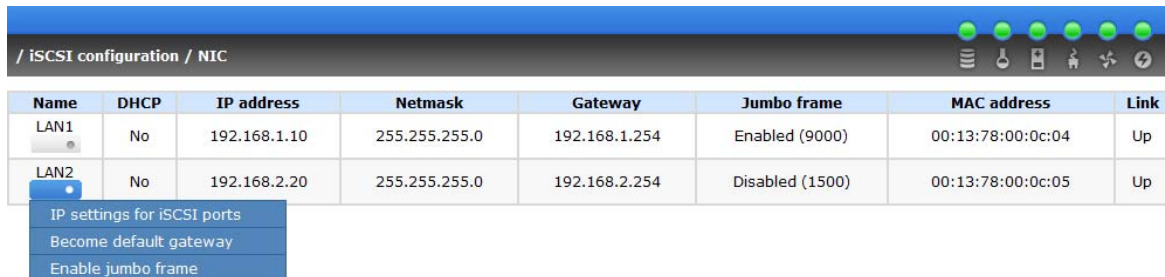
Confirm



NOTE: The entity name of the iSCSI RAID subsystem cannot be changed.

3.5.2 NIC

Select **“NIC”** to change IP addresses of iSCSI data ports. There are two gigabit LAN ports to transmit data. Each of them must be assigned one IP address in multi-homed mode.

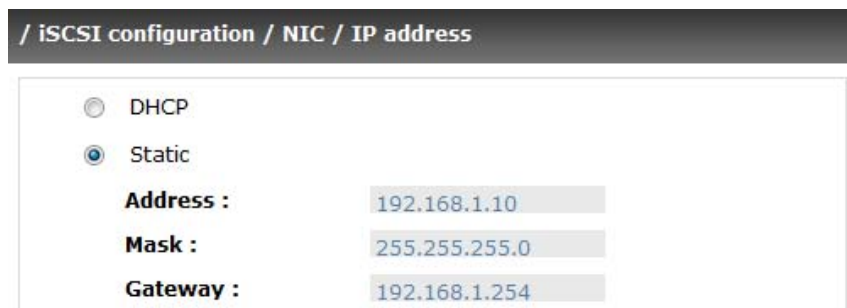


Name	DHCP	IP address	Netmask	Gateway	Jumbo frame	MAC address	Link
LAN1	No	192.168.1.10	255.255.255.0	192.168.1.254	Enabled (9000)	00:13:78:00:0c:04	Up
LAN2	No	192.168.2.20	255.255.255.0	192.168.2.254	Disabled (1500)	00:13:78:00:0c:05	Up

The screenshot above shows the 2 iSCSI data ports. Each of them is set to static IP. LAN1 has Jumbo Frame enabled.

IP settings:

User can change IP address by moving mouse to the gray button of LAN port, click **“IP settings for iSCSI ports”**. There are 2 selections, DHCP (Get IP address from DHCP server) or Static (Static IP address).



/ iSCSI configuration / NIC / IP address

☐ DHCP
☒ Static

Address : 192.168.1.10
 Mask : 255.255.255.0
 Gateway : 192.168.1.254

Default gateway:

Default gateway can be changed by moving mouse to the gray button of LAN port, then click **“Become default gateway”**. There is only one default gateway.

MTU / Jumbo frame:

MTU (Maximum Transmission Unit) size can be enabled by moving mouse to the gray button of LAN port, then click **“Enable jumbo frame”**.



WARNING: The MTU size of network switch / hub and HBA on host must also be enabled. Otherwise, the LAN connection can not work properly.

3.5.3 Node

Select **“Node”** to view the target name for iSCSI node. Press **“Authenticate”** to enable CHAP authentication. **CHAP** is the abbreviation of Challenge Handshake Authorization Protocol. CHAP is a strong authentication method used in point-to-point for user login. It's a type of authentication in which the authentication server sends the client a key to be used for encrypting the username and password. CHAP enables the username and password to transmitting in an encrypted form for protection.

Auth	Node name
None	iqn.1997-05.tw.com.proware:dp-504-g1a3-000ae0074:default-target

Authenticate

To use CHAP authentication, please follow the steps:

1. Click **“Authenticate”**.
2. Select **“CHAP”**.

/ iSCSI configuration / Node / Authenticate

Authentication : CHAP

3. Click **“Confirm”**. CHAP authentication has been enabled.

Auth	Node name
CHAP	iqn.1997-05.tw.com.proware:dp-504-g1a3-000ae0074:default-target

Authenticate

4. Go to **“/ iSCSI configuration / CHAP account”** page to create CHAP account. Please refer to CHAP Account section for more detail.
5. To disable CHAP, select **“None”** in **“Authenticate”** page.

/ iSCSI configuration / Node / Authenticate

Authentication : None



NOTE: After setting CHAP, the initiator in host/server should be set the same Account/Password. Otherwise, user cannot login.

3.5.4 Session

“**Session**” function can display iSCSI session and connection information, including the following items:

1. Host (Initiator Name)
2. Error Recovery Level
3. Error Recovery Count
4. Detail of Authentication status and Source IP: port number.

/ iSCSI configuration / Session				
No.	Initiator name	TPGT	Error recovery level	Error recovery count
0	iqn.1991-05.com.microsoft:gerry-nb	0x00	0	0

Move the mouse pointer to the gray button of session number and click “**List connection**”. It will list all connection(s) of the session.

/ iSCSI configuration / Session / Connection			
No.	Initiator IP	Initiator name	Authentication
1	192.168.1.210	iqn.1991-05.com.microsoft:gerry-nb	No



3.5.5 CHAP Account

Enter **“CHAP account”** function to create a CHAP account for authentication.

To setup CHAP account, please follow these steps:

1. Click **“Create”**.
2. Enter account name in **“User”** box, and type the secret in **“Secret”** and **“Confirm”** boxes.

User : (max: 223)
Secret : (min: 12, max: 16)
Confirm : (min: 12, max: 16)

3. Click **“Confirm”**. The CHAP account will be created.

User
chap1

4. To delete the CHAP account, select **“Delete”**.



NOTE: Only one CHAP account can be created in the iSCSI RAID subsystem.

3.6 Volume Configuration

“**Volume configuration**” is designed for setting up the volume configuration which includes “**Volume create wizard**”, “**Physical disk**”, “**RAID group**”, “**Virtual disk**”, and “**Logical unit**”.

/ Volume configuration	
Volume creation wizard	Easy and quick step-by-step volume configuration
Physical disk	Hard disks to store data
RAID group	Sets of physical disks with RAID functions
Virtual disk	Slices of RAID groups
Logical unit	Target volumes for hosts access



NOTE: Snapshot function is not available in this model of iSCSI RAID subsystem.

3.6.1 Volume Create Wizard

“Volume create wizard” has a smarter policy. When the system is inserted with some HDDs. “Volume create wizard” lists all possibilities and sizes in different RAID levels, it will use all available HDDs for RAID level depends on which user chooses. When system has different sizes of HDDs, e.g., 3*200G and 1*80G, it lists all possibilities and combination in different RAID level and different sizes. After user chooses RAID level, user may find that some HDDs are available (free status). The result is using smarter policy. It gives user:

1. Biggest capacity of RAID level for user to choose and,
2. The fewest disk number for RAID level / volume size.

E.g., user chooses RAID 5 and the controller has 3*200G and 1*120G HDDs inserted. If we use all 4 HDDs for a RAID 5, the maximum size of volume is 360G (120G*3). By the wizard, it does a smart check and finds out the most efficient way of using HDDs. The wizard only uses 200G HDDs (RAID5 Volume size is 200G*2=400G), the volume size is bigger and fully uses HDD capacity.

Step 1: Select **“Volume create wizard”** and then choose the RAID level. After the RAID level is chosen, click **“Next”**. Then it will link to next page.

/ Volume configuration / Volume create wizard / Step 1

RAID level :

- RAID 0 (3725 GB) -
- RAID 0 (3725 GB) -
- RAID 1 (931 GB) -
- RAID 3 (2793 GB) -
- RAID 5 (2793 GB) -
- RAID 6 (1862 GB) -
- RAID 0+1 (1862 GB) -

Step 2: Select custom configuration from a list of combination of the RG capacity, or **“Use default algorithm”** for maximum RG capacity. After RG size is chosen, click **“Next”**.

/ Volume configuration / Volume create wizard / Step 2

☐ Use default algorithm
☒ Customization

RAID group:

- new 3 disk (1862 GB) -
- new 3 disk (1862 GB) -
- new 4 disk (2793 GB) -

Step 3: Decide VD size. User can enter a number less or equal to the default number.
Then click “**Next**”.

/ Volume configuration / Volume create wizard / Step 3

Volume size (GB):

Step 4: Confirm page. Click “**Confirm**” if all settings are correct. Then a VD will be created.

/ Volume configuration / Volume create wizard / Step 4

RAID level: RAID 5
RAID group: new rg
Volume size (GB): 1862

<< Back Confirm

It's done. You can start to use the system now (connect initiator/host to LUN).

No.	Name	Total (GB)	Free (GB)	#PD	#VD	Status	Health	RAID
1	QUICK37598	1862	0	3	1	Online	Good	RAID 5

3.6.2 Physical Disk

Enter **“Physical disk”** to view the status of hard drives inserted in the system. The following are operation tips:

1. Move the mouse pointer to the gray button next to the number of slot, it will show the functions which can be executed.
2. Active function(s) can be selected, but inactive function(s) will show in gray color.

For example, set PD slot number 4 to dedicated spare disk.

Step 1: Move the mouse pointer to the gray button of PD Slot 4, then select **“Set Dedicated spare”**. It will link to the next page.

The screenshot shows the 'Physical disk' page with a table of disk slots. Slot 4 is selected, and a context menu is open with the following options: Set Free disk, Set Global spare, Set Dedicated spare, Set property, and More information. The 'Set Dedicated spare' option is highlighted.

Slot	Size (GB)	RG name	Status	Health	Usage	Vendor	Serial	Type	Write cache	Standby
1	931	QUICK37598	Online	Good	RD	WDC	WD-WCASJ0293107 WD-	SATA2	Enabled	Disabled
2	931	QUICK37598	Online	Good	RD	WDC	WD-WCASJ0494131 WD-	SATA	Enabled	Disabled
3	931	QUICK37598	Online	Good	RD	Seagate	5QJ0DH1R	SATA2	Enabled	Disabled
4	931		Online	Good	FR	Hitachi	GTA000PAG06SZA	SATA2	Enabled	Disabled

Step 2: It will show available RGs which can be assigned dedicated spare disk. To assign the spare disk, select the RG (enable the radio button) then click **“Confirm”**.

The screenshot shows the 'Physical disk' page with a table of available RGs for slot 4. The first row is selected, and the 'Confirm' button is visible.

No.	Name	Total (GB)	Free (GB)	#PD	#VD	Status	Health	RAID
1	QUICK37598	1862	0	3	1	Online	Good	RAID 5

<< Back Confirm

It's done. View the **“Physical disk”** page.

The screenshot shows the 'Physical disk' page with a table of disk slots. Slot 4 is now set as a dedicated spare disk, and its usage is shown as 'DS'.

Slot	Size (GB)	RG name	Status	Health	Usage	Vendor	Serial	Type	Write cache	Standby
1	931	QUICK37598	Online	Good	RD	WDC	WD-WCASJ0293107 WD-	SATA2	Enabled	Disabled
2	931	QUICK37598	Online	Good	RD	WDC	WD-WCASJ0494131 WD-	SATA	Enabled	Disabled
3	931	QUICK37598	Online	Good	RD	Seagate	5QJ0DH1R	SATA2	Enabled	Disabled
4	931	QUICK37598	Online	Good	DS	Hitachi	GTA000PAG06SZA	SATA2	Enabled	Disabled

Physical disks of slots 1, 2, and 3 are used for RG named “QUICK37598”. Slot 4 is set as dedicated spare disk for RG “QUICK37598”.

PD column description:

Slot	The position of hard drives. The button next to the number of slot shows the functions which can be executed.
Size (GB)	Capacity of hard drive.
RG Name	Related RAID Group name.
Status	The status of hard drive. “Online” → the hard drive is online. “Rebuilding” → the hard drive is being rebuilt. “Transition” → the hard drive is being migrated or is replaced by another disk when rebuilding occurs. “Missing” → the hard drive has already joined a RG but not plugged into the disk tray of current system.
Health	The health of hard drive. “Good” → the hard drive is good. “Failed” → the hard drive is failed. “Error Alert” → S.M.A.R.T. error alert. “Read Errors” → the hard drive has unrecoverable read errors.
Usage	“RD” → RAID Disk. This hard drive has been set to RAID. “FR” → FRee disk. This hard drive is free for use. “DS” → Dedicated Spare. This hard drive has been set to the dedicated spare of the RG. “GS” → Global Spare. This hard drive has been set to a global spare of all RGs. “RS” → ReServe. The hard drive contains the RG information but cannot be used. It may be caused by an uncompleted RG set, or hot-plug of this disk in the running time. In order to protect the data in the disk, the status changes to reserve. It can be reused after setting it to “FR” manually.
Vendor	Hard drive vendor.
Serial	Hard drive serial number.
Type	Hard drive type. “SATA” → SATA disk. “SATA2” → SATA II disk.
Write cache	Hard drive write cache is enabled or disabled.

Standby	HDD auto spin-down to save power. The default value is disabled.
----------------	--

PD operations description:

Set Free disk	Make the selected hard drive to be free for use.
Set Global spare	Set the selected hard drive as global spare of all RGs.
Set Dedicated spares	Set the hard drive as dedicated spare of selected RG.
Set property	Change the status of write cache and standby. Write cache options: “Enabled” → Enable disk write cache. “Disabled” → Disable disk write cache. Standby options: “Disabled” → Disable spin-down. “30 sec / 1 min / 5 min / 30 min” → Enable hard drive auto spin-down to save power in the period of time.
More information	Show hard drive detail information.

3.6.3 RAID Group

Enter **“RAID group”** to view the status of each volume group.

The following is an example of how to create a RG:

Step 1: Click **“Create”**, enter the **RAID Group Name**, choose a **RAID level**, click **“Select PD”** to select Physical Disks. Then click **“Next”**.

Step 2: Confirm page. Click **“Confirm”** if all settings are correct.

It's done. View the **“RAID group”** page.

No.	Name	Total (GB)	Free (GB)	#PD	#VD	Status	Health	RAID
1	RG1	152	152	3	0	Online	Good	RAID 5

The example above shows RAID 5 with 3 physical disks, and RG is named “RG1”. The total size is 152GB.

RG column description:

No.	Number of RAID group. The button next to the No. shows the functions which can be executed.
Name	RAID group name.
Total(GB)	Total capacity of this RAID group.
Free(GB)	Free capacity of this RAID group.
#PD	The number of physical disks in RAID group.
#VD	The number of virtual disks in RAID group.
Status	The status of RAID group. “Online” → the RAID group is online. “Offline” → the RAID group is offline. “Rebuild” → the RAID group is being rebuilt. “Migrate” → the RAID group is being migrated. “Scrub” → the RAID group is being scrubbed.
Health	The health of RAID group. “Good” → the RAID group is good. “Failed” → the hard drive is failed. “Degraded” → the RAID group is not completed. The reason could be lack of one disk or disk failure.
RAID	The RAID level of the RAID group.

RG operations description:

Create	Create a RAID group.
Migrate	Migrate a RAID group. Please refer to succeeding chapter for more detail.
Activate	Activate a RAID group; it can be executed when RG status is offline. This is for online roaming purpose.
Deactivate	Deactivate a RAID group; it can be executed when RG status is online. This is for online roaming purpose.
Scrub	Scrub a RAID group. It's a parity regeneration function. It supports RAID 3 / 5 / 6 only.
Delete	Delete a RAID group.
Set disk property	Change the disk status of write cache and standby. Write cache options: "Enabled" → Enable disk write cache. "Disabled" → Disable disk write cache. Standby options: "Disabled" → Disable spin-down. "30 sec / 1 min / 5 min / 30 min" → Enable hard drive auto spin-down to save power in the period of time.
More information	Show RAID group detail information.

3.6.4 Virtual Disk

Enter “**Virtual disk**” function to view the status of each user data volume.

The following is an example of how to create a VD:

Step 1: Click “**Create**”, enter the **Virtual Disk Name**, choose **RG name**, change **Capacity** if necessary, select **Stripe height**, **Block size**, **Read / Write** cache mode, volume **Priority**, and **Bg rate** (Background task priority). Then click “**Confirm**”.

The screenshot shows the 'Create' page for a Virtual Disk. The breadcrumb is '/ Volume configuration / Virtual disk / Create'. The form fields are as follows:

- Name :** VD1
- RG name :** RG1
- Capacity (GB) :** 1862
- Stripe height (KB) :** 64
- Block size (B) :** 512
- Read/Write :** ☐ Write-through cache ☒ Write-back cache
- Priority :** ☒ High priority ☐ Middle priority ☐ Low priority
- Bg rate :** 4

At the bottom right, there are two buttons: '<< Back' and 'Confirm'.

Step 2: Confirm page. Click “**Confirm**” if all setups are correct.

The screenshot shows the 'Confirm' page for a Virtual Disk. The breadcrumb is '/ Volume configuration / Virtual disk'. It displays a table with the following data:

No.	Name	Size (GB)	Right	Priority	Bg rate	Status	Health	R %	RAID	#LUN	RG name
1	VD1	1862	WB	HI	4	Initiating	Optimal	0	RAID 5	0	RG1

At the bottom right, there is a 'Create' button.

It's done. View the “**Virtual disk**” page.

VD column description:

No.	Number of this Virtual disk. The button next to the VD No. shows the functions which can be executed.
Name	Virtual disk name.
Size(GB)	Total capacity of the Virtual disk.
Right	“WT” → Write Through. “WB” → Write Back. “RO” → Read Only.
Priority	“HI” → High priority. “MD” → MiD priority. “LO” → Low priority.
Bg rate	Background task priority. “4 / 3 / 2 / 1 / 0” → Default value is 4. The higher number the background priority of a VD has, the more background I/O will be scheduled to execute.
Status	The status of Virtual disk. “Online” → the Virtual disk is online. “Offline” → the Virtual disk is offline. “Initiating” → the Virtual disk is being initialized. “Rebuild” → the Virtual disk is being rebuilt. “Migrate” → the Virtual disk is being migrated. “Scrub” → the Virtual disk is being scrubbed.
Health	The health of Virtual disk. “Optimal” → the Virtual disk is operating and has experienced no failures of the disks that comprise the RG. “Degraded” → At least one disk which comprises space of the Virtual disk has been marked as failed or has been plugged. “Missing” → the Virtual disk has been marked as missing by the system. “Failed” → the Virtual disk has experienced enough failures of the disks that comprise the VD for unrecoverable data loss to occur. “Part optimal” → the Virtual disk has experienced disk failures.

R %	Ratio of initializing or rebuilding.
RAID	The levels of RAID that Virtual disk is using.
#LUN	Number of LUN(s) that Virtual disk is attaching.
RG name	The Virtual disk is related to the RG name

VD operations description:

Extend	Extend a Virtual disk capacity.
Scrub	Scrub a Virtual disk. It's a parity regeneration function. It supports RAID 3 / 5 / 6 only.
Delete	Delete a Virtual disk.
Set property	Change the VD name, right, priority and bg rate. Right options: "WT" → Write Through. "WB" → Write Back. "RO" → Read Only. Priority options: "HI" → High priority. "MD" → MiD priority. "LO" → Low priority. Bg rate options: "4 / 3 / 2 / 1 / 0" → Default value is 4. The higher number the background priority of a VD has, the more background I/O will be scheduled to execute.
Attach LUN	Attach to a LUN.
Detach LUN	Detach to a LUN.
List LUN	List attached LUN(s).
More information	Show Virtual disk detail information.

3.6.5 Logical Unit

Enter **“Logical unit”** function to view the status of attached logical unit number (LUN) of each VD.

User can attach LUN by clicking the **“Attach”**. Select the VD to attach in the **“VD”** field. In the **“Host”** field, enter the iSCSI node name for access control, or use the default wildcard **“*”**, which means every host can access the volume. Choose LUN number and permission, and click **“Confirm”**.

/ Volume configuration / Logical unit / Attach

VD : VD1 (1862GB)

Host (iSCSI node name) : *

LUN : -0-

Permission : ☐ Read-only ☒ Read-write

<< Back Confirm

LUN operations description:

Attach	Attach a logical unit number to a Virtual disk.
Detach	Detach a logical unit number from a Virtual disk.

/ Volume configuration / Logical unit

Host	LUN	Permission	VD name	#Session
*	0	Read write	VD1	0

Detach Attach

The matching rules of access control are inspected from top to bottom in sequence. For example: there are 2 rules for the same VD, one is **“*”**, LUN 0; and the other is **“iqn.host1”**, LUN 1. Another host **“iqn.host2”** can login successfully because it matches the rule 1.

The access will be denied when there is no matching rule.

3.6.6 Example

The following is an example for creating volumes. Example 1 is to create two VD's and set a global spare disk.

➤ Example 1

Example 1 is to create two VD's in one RG, each VD uses global cache volume. Global cache volume is created after system boots up automatically. So, no action is needed to set CV. Then set a global spare disk. Eventually, delete all of them.

Step 1: Create RG (RAID group).

To create the RAID group, please follow the procedures:

1. Select “/ **Volume configuration / RAID group**”.
2. Click “**Create**”.
3. Input RG Name, choose RAID level from the list, click “**Select PD**” to choose the Physical Disk slot(s), then click “**Next**”.

/ Volume configuration / RAID group / Create

Name : RG1-R5

RAID level : RAID 5

RAID PD slot : 1 2 3 Select PD

Write Cache : Enabled

Standby : Disabled

Command Queuing : Enabled

<< Back Next >>

4. Check the outcome. Click “**Confirm**” if all settings are correct.
5. Done. A RG has been created.

No.	Name	Total (GB)	Free (GB)	#PD	#VD	Status	Health	RAID
1	RG1-R5	1862	1862	3	0	Online	Good	RAID 5

Create

Step 2: Create VD (Virtual disk).

To create a volume, please follow these steps:

1. Select “/ **Volume configuration / Virtual disk**”.
2. Click “**Create**”.
3. Input a VD name, choose a RG Name and enter a size of VD; decide the stripe high, block size, read/write mode and set priority, finally click “**Confirm**”.

/ Volume configuration / Virtual disk / Create

Name : VD1

RG name : RG1-R5

Capacity (GB) : 1000

Stripe height (KB) : 64

Block size (B) : 512

Read/Write : ☐ Write-through cache ☒ Write-back cache

Priority : ☒ High priority ☐ Middle priority ☐ Low priority

Bg rate : 4

<< Back Confirm

4. Done. A VD has been created.

/ Volume configuration / Virtual disk

No.	Name	Size (GB)	Right	Priority	Bg rate	Status	Health	R %	RAID	#LUN	RG name
1	VD1	1000	WB	HI	4	Initiating	Optimal	0	RAID 5	0	RG1-R5

Create

5. Do one more time to create another VD.

/ Volume configuration / Virtual disk / Create

Name : VD2

RG name : RG1-R5

Capacity (GB) : 862

Stripe height (KB) : 64

Block size (B) : 512

Read/Write : ☐ Write-through cache ☒ Write-back cache

Priority : ☒ High priority ☐ Middle priority ☐ Low priority

Bg rate : 4

<< Back Confirm

No.	Name	Size (GB)	Right	Priority	Bg rate	Status	Health	R %	RAID	#LUN	RG name
1	VD1	1000	WB	HI	4	Initiating	Optimal	2	RAID 5	0	RG1-R5
2	VD2	862	WB	HI	4	Initiating	Optimal	0	RAID 5	0	RG1-R5

Step 3: Attach LUN to VD.

There are **2 methods** to attach LUN to VD.

1. In “/ **Volume configuration / Virtual disk**”, move the mouse pointer to the gray button next to the VD number; click “**Attach LUN**”.

No.	Name	Size (GB)	Right	Priority	Bg rate	Status	Health	R %	RAID	#LUN	RG name
1	VD1	1000	WB	HI	4	Initiating	Optimal	3	RAID 5	0	RG1-R5
2	VD2	512	WB	HI	4	Initiating	Optimal	0	RAID 5	0	RG1-R5

2. In “/ **Volume configuration / Logical unit**”, click “**Attach**”.

The procedures are as follows:

1. Select a VD.
2. Input “**Host**” name, which is a FC node name for access control, or fill-in wildcard “*”, which means every host can access to this volume. Choose LUN and permission, and then click “**Confirm**”.

VD : VD1 (1000GB)

Host (iSCSI node name) : iqn.1991-05.com.microsoft:test1

LUN : - 0 -

Permission : ☐ Read-only ☒ Read-write

<< Back Confirm

3. Done.

Host	LUN	Permission	VD name	#Session
iqn.1991-05.com.microsoft:test1	0	Read write	VD1	0

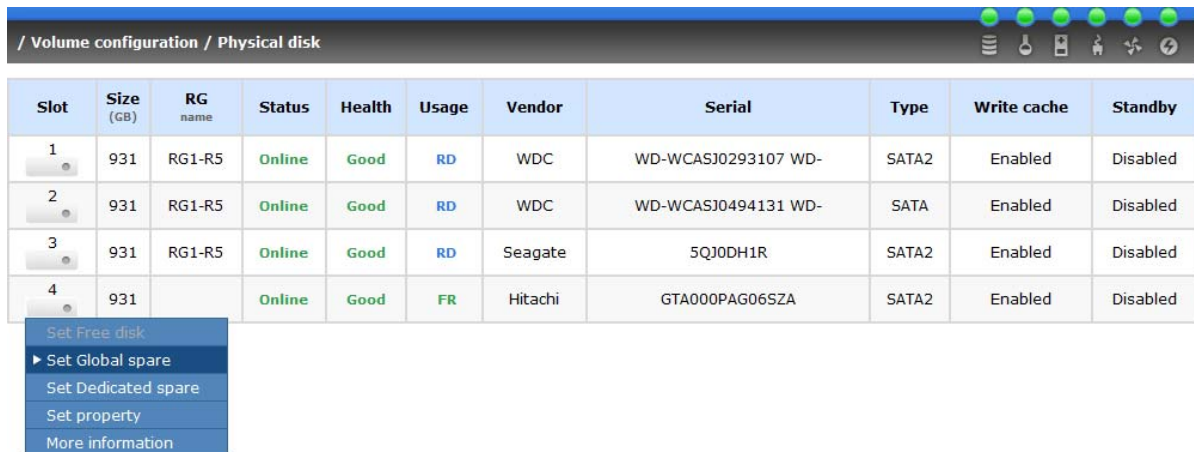


NOTE: The matching rules of access control are from top to bottom in sequence.

Step 4: Set global spare disk.

To set a global spare disk, please follow the step.

1. Select “/ **Volume configuration / Physical disk**”.
2. Move the mouse pointer to the gray button next to the PD slot; click “**Set Global spare**”.



3. “**GS**” icon is shown in “**Usage**” column.

Slot	Size (GB)	RG name	Status	Health	Usage	Vendor	Serial	Type	Write cache	Standby
1	931	RG1-R5	Online	Good	RD	WDC	WD-WCASJ0293107 WD-	SATA2	Enabled	Disabled
2	931	RG1-R5	Online	Good	RD	WDC	WD-WCASJ0494131 WD-	SATA	Enabled	Disabled
3	931	RG1-R5	Online	Good	RD	Seagate	5QJ0DH1R	SATA2	Enabled	Disabled
4	931		Online	Good	GS	Hitachi	GTA000PAG06SZA	SATA2	Enabled	Disabled

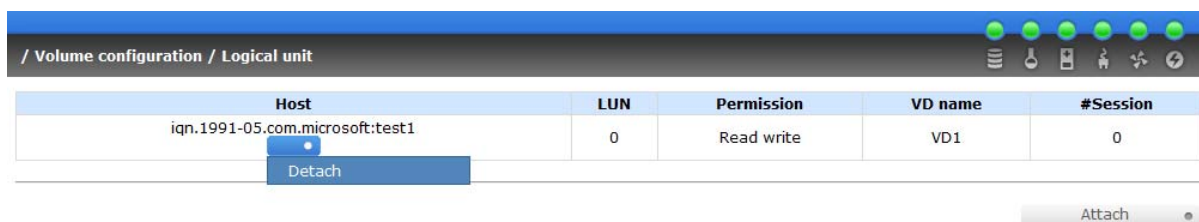
Step 5: Done. Host initiator can connect to the LUN(s) and use as disk(s).

To delete VD and RG, please follow the steps listed below.

Step 6: Detach LUN from VD.

In “/ **Volume configuration / Logical unit**”,

1. Move the mouse pointer to the gray button next to the LUN; click “**Detach**”. There will pop up a confirmation page.



2. Choose “**OK**”.
3. Done.

Step 7: Delete VD (Virtual disk).

To delete a Virtual disk, please follow the steps:

1. Select “/ **Volume configuration / Virtual disk**”.
2. Move the mouse pointer to the gray button next to the VD number; click “**Delete**”. There will pop up a confirmation page, click “**OK**”.
3. Done. The VD is deleted.



NOTE: When deleting VD, the attached LUN(s) related to this VD will be detached automatically.

Step 8: Delete RG (RAID group).

To delete a RAID group, please follow the steps:

1. Select “/ **Volume configuration / RAID group**”.
2. Select a RG which has no VD related on this RG, otherwise the VD(s) on this RG must be deleted first.
3. Move the mouse pointer to the gray button next to the RG number click “**Delete**”.
4. There will pop up a confirmation page, click “**OK**”.
5. Done. The RG has been deleted.



NOTE: The action of deleting one RG will succeed only when all the related VD(s) have been deleted in this RG. Otherwise, it will show an error when deleting this RG.

Step 9: Free global spare disk.

To free global spare disks, please follow the steps.

1. Select “/ **Volume configuration / Physical disk**”.
2. Move the mouse pointer to the gray button next to the PD slot; click “**Set Free disk**”.

Step 10: Done. A global spare disk has been deleted and became free disk.

3.7 Enclosure Management

“**Enclosure management**” function allows managing enclosure information including “**SES config**”, “**Hardware monitor**”, “**S.M.A.R.T.**” and “**UPS**” functions. For the enclosure management, there are many sensors for different purposes, such as temperature sensors, voltage sensors, hard disks, fan sensors, power sensors, and LED status. And due to the hardware characteristics are different among these sensors, for different sensors, they have different polling intervals. Below is the detail about polling time intervals:

1. Temperature sensors: 1 minute.
2. Voltage sensors: 1 minute.
3. Hard disk sensors: 10 minutes.
4. Fan sensor: 10 seconds, when there are continuous 3 times of error, controller sends ERROR event log.
5. Power sensor: 10 seconds, when there are continuous 3 times of error, controller sends ERROR event log.
6. LED status: 10 seconds.

/ Enclosure management	
SES configuration	Access control for SES management
Hardware monitor	System monitored voltage, temperature and battery backup module
S.M.A.R.T.	Self-monitoring analysis and reporting technology for physical disks
UPS	Uninterruptible power supply

3.7.1 SES Configuration

SES represents **SCSI Enclosure Services**, one of the enclosure management standards. Use “**SES config**” function to enable or disable the management of SES.

To enable SES:

1. Click “**Enable**”.

The screenshot shows the 'Enclosure management / SES configuration' page. It features a table with two columns: 'Host' and 'LUN'. Below the table, there is an 'Enable' button.

Host	LUN

Enable

2. Enter Host name (iSCSI node name). Click “**Confirm**”.

The screenshot shows the 'Enclosure management / SES configuration / Enable' page. It features a text input field for 'Host (iSCSI node name)'. Below the input field, there are '<< Back' and 'Confirm' buttons.

Host (iSCSI node name) : *

<< Back Confirm

3. Done.

The screenshot shows the 'Enclosure management / SES configuration' page. It features a table with two columns: 'Host' and 'LUN'. Below the table, there is a 'Disable' button.

Host	LUN
*	0

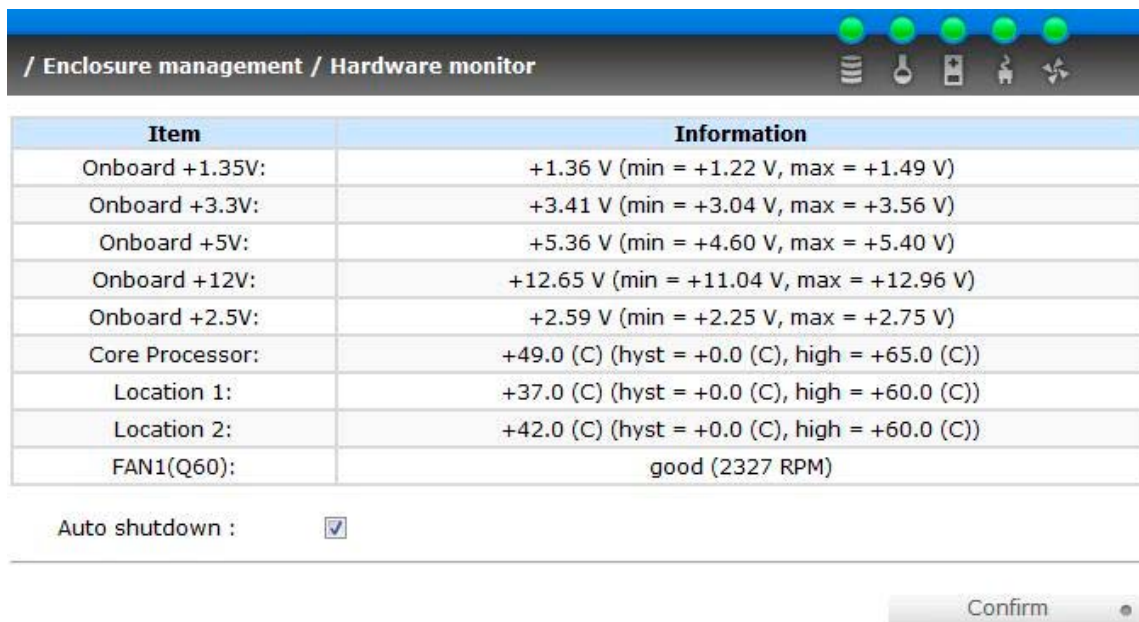
Disable

The SES client software is available at the following web site:

SANtools: <http://www.santools.com/>

3.7.2 Hardware Monitor

Enter “**Hardware monitor**” function to view the information of current voltage, temperature, and fan status.



The screenshot shows the 'Hardware monitor' screen with a blue header bar. Below the header is a table with two columns: 'Item' and 'Information'. The table lists various system metrics including onboard voltages, core processor temperature, and fan status. At the bottom, there is a checkbox for 'Auto shutdown' which is checked, and a 'Confirm' button.

Item	Information
Onboard +1.35V:	+1.36 V (min = +1.22 V, max = +1.49 V)
Onboard +3.3V:	+3.41 V (min = +3.04 V, max = +3.56 V)
Onboard +5V:	+5.36 V (min = +4.60 V, max = +5.40 V)
Onboard +12V:	+12.65 V (min = +11.04 V, max = +12.96 V)
Onboard +2.5V:	+2.59 V (min = +2.25 V, max = +2.75 V)
Core Processor:	+49.0 (C) (hyst = +0.0 (C), high = +65.0 (C))
Location 1:	+37.0 (C) (hyst = +0.0 (C), high = +60.0 (C))
Location 2:	+42.0 (C) (hyst = +0.0 (C), high = +60.0 (C))
FAN1(Q60):	good (2327 RPM)

Auto shutdown : ☒

Confirm

If “**Auto shutdown**” has been checked, the system will shutdown automatically when voltage or temperature is out of the normal range. For better data protection, please check “**Auto Shutdown**”.

For better protection and to avoid single short period of high temperature triggering Auto shutdown, the iSCSI RAID subsystem use multiple condition judgments for Auto shutdown, below is the detail of when the Auto shutdown will be triggered.

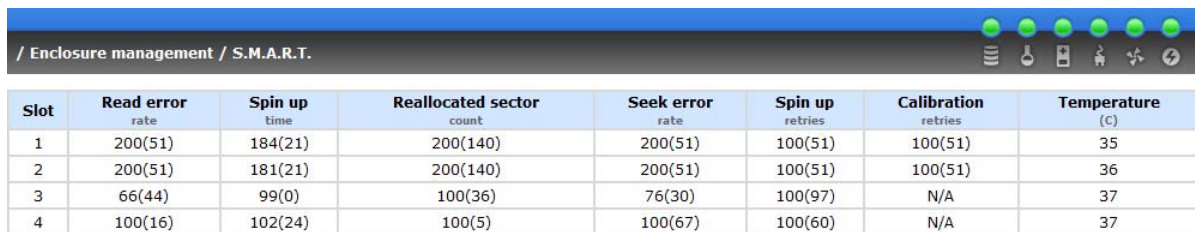
1. There are 3 sensors placed on the controller for temperature checking, one for core processor and the other for the board. The iSCSI RAID subsystem will check each sensor every 30 seconds. When one of these sensors is over the high temperature value for 3 times, the Auto shutdown will be triggered immediately.
2. The core processor temperature limit is 70°C (alarm at 65°C). The board temperature limit is 65°C (alarm at 60°C).
3. If the high temperature situation doesn't detected by 3 times, the subsystem will not do auto shutdown.

3.7.3 Hard Drive S.M.A.R.T. Function

S.M.A.R.T. (**S**elf-**M**onitoring **A**nalysis and **R**eporting **T**echnology) is a diagnostic tool for hard drives to deliver warning of drive failures in advance. S.M.A.R.T. provides users chances to take actions before possible drive failure.

S.M.A.R.T. measures many attributes of the hard drive all the time and inspects the properties of hard drives which are close to be out of tolerance. The advanced notice of possible hard drive failure can allow users to back up hard drive or replace the hard drive. This is much better than hard drive crash when it is writing data or rebuilding a failed hard drive.

“**S.M.A.R.T.**” function can display S.M.A.R.T. information of hard drives. There are two values: the number on the left is the current value, and the number in parenthesis is the threshold value. If the current value becomes lower than the threshold value, the hard drive is in unstable state. The threshold values of hard drive vendors are different. Please refer to vendors' specification for details.



Slot	Read error rate	Spin up time	Reallocated sector count	Seek error rate	Spin up retries	Calibration retries	Temperature (C)
1	200(51)	184(21)	200(140)	200(51)	100(51)	100(51)	35
2	200(51)	181(21)	200(140)	200(51)	100(51)	100(51)	36
3	66(44)	99(0)	100(36)	76(30)	100(97)	N/A	37
4	100(16)	102(24)	100(5)	100(67)	100(60)	N/A	37

3.7.4 UPS

Enter **“UPS”** function to set up UPS (**U**ninterruptible **P**ower **S**upply).

/ Enclosure management / UPS

UPS type : None ▼

Shutdown battery level (%) : 5 ▼

Shutdown delay (s) : 180 ▼

Shutdown UPS : OFF ▼

Status :

Battery level : 0%

Currently, the system only support and communicate with smart-UPS from APC (American Power Conversion Corp.). Please check detail from <http://www.apc.com/>.

First, connect the RAID system UPS port and the APC UPS via RS-232 for communication. Then set up the shutdown values when the power is gone. UPS of other vendors can work fine, but they have no such function of communication.

UPS Type	Select UPS Type. Choose Smart-UPS for APC, None for other vendors or no UPS.
Shutdown Battery Level (%)	When below the setting level, system will shutdown. Setting level to “0” will disable UPS.
Shutdown Delay (s)	If power failure occurred, and system can not return to value setting status, the system will shutdown. Setting delay to “0” will disable the function.
Shutdown UPS	Select ON, when power is gone, UPS will shutdown by itself after the system shutdown successfully. After power comes back, UPS will start working and notify system to boot up. OFF will not.
Status	The status of UPS. “Detecting...” “Running” “Unable to detect UPS” “Communication lost” “UPS reboot in progress” “UPS shutdown in progress” “Batteries failed. Please change them NOW!”
Battery Level (%)	Current percentage of battery level.

3.8 System Maintenance

“**Maintenance**” allows the operation of system functions which include “**System information**” to show the system version, “**Upgrade**” to update firmware to latest version, “**Reset to factory default**” to reset all controller configuration values to factory settings, “**Import and export**” to import and export all controller configuration, “**Event log**” to view system event log to record critical events, and “**Reboot and shutdown**” to either reboot or shutdown the system.

/ Maintenance	
System information	System information
Upgrade	Remote upload firmware
Reset to factory default	Reset to factory default
Import and export	Import/export configurations
Event log	System event log to record critical events
Reboot and shutdown	Reboot or shutdown system

3.8.1 System Information

“**System information**” can display system information (including firmware version), CPU type, installed system memory, controller serial number, backplane ID.

/ Maintenance / System information

System information

DP-504-G1A3 1.0.2 (build 200812121700)

CPU type

XScale-IOP80331 rev 10 (v5l)

Installed system memory

ECC DDR 512MB

Controller serial no.

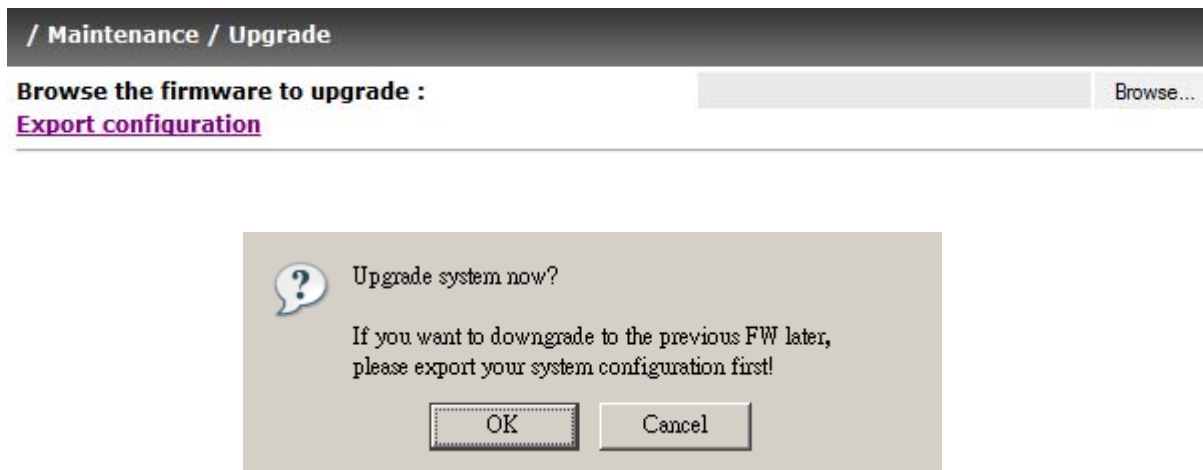
001378AE0074

Backplane ID

Q60

3.8.2 Upgrade

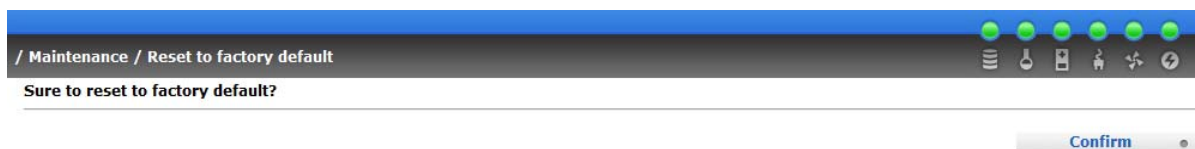
“Upgrade” can upgrade firmware. Please prepare new firmware file named **“xxxx.bin”** in local hard drive, then click **“Browse”** to select the file. Click **“Confirm”**, it will pop up a message “Upgrade system now? If you want to downgrade to the previous FW later (not recommended), please export your system configuration first!”. Click **“Cancel”** to export system configuration in advance, or click **“OK”** to start to upgrade firmware.



When upgrading, there is a progress bar running. After finished upgrading, the system must reboot manually to make the new firmware take effect.

3.8.3 Reset to Default

Enter **“Reset to default”** function, which allows user to reset the controller to the factory default setting.



Reset to default value, the password is: **00000000**, and IP address to default DHCP.

Default IP address: **192.168.10.50** (DHCP)

Default subnet mask: **255.255.255.0**

Default gateway: **192.168.10.254**

3.8.4 Config Import & Export

Use “**Import and export**” function to import or export configuration. “Export” allows user to save system configuration values, and “Import” to apply saved configuration. For the volume configuration setting, the values are available in export and not available in import which can avoid conflict or data deletion between two controllers. For example, if one controller already has existing valuable data in the disks and user may forget to overwrite it. Use import could return to original configuration. If the volume setting was also imported, user’s current data will be overwritten.



The screenshot shows a web-based interface for system maintenance. At the top, there is a header bar with the text "/ Maintenance / Import and export". Below this, there is a section titled "Import/Export :". To the right of this title is a dropdown menu. The dropdown menu is open, showing three options: "Import", "Import", and "Export". The "Import" option is currently selected and highlighted in blue. Below the dropdown menu, there is a text input field labeled "Import file :". To the right of this field is a button labeled "Browse...".

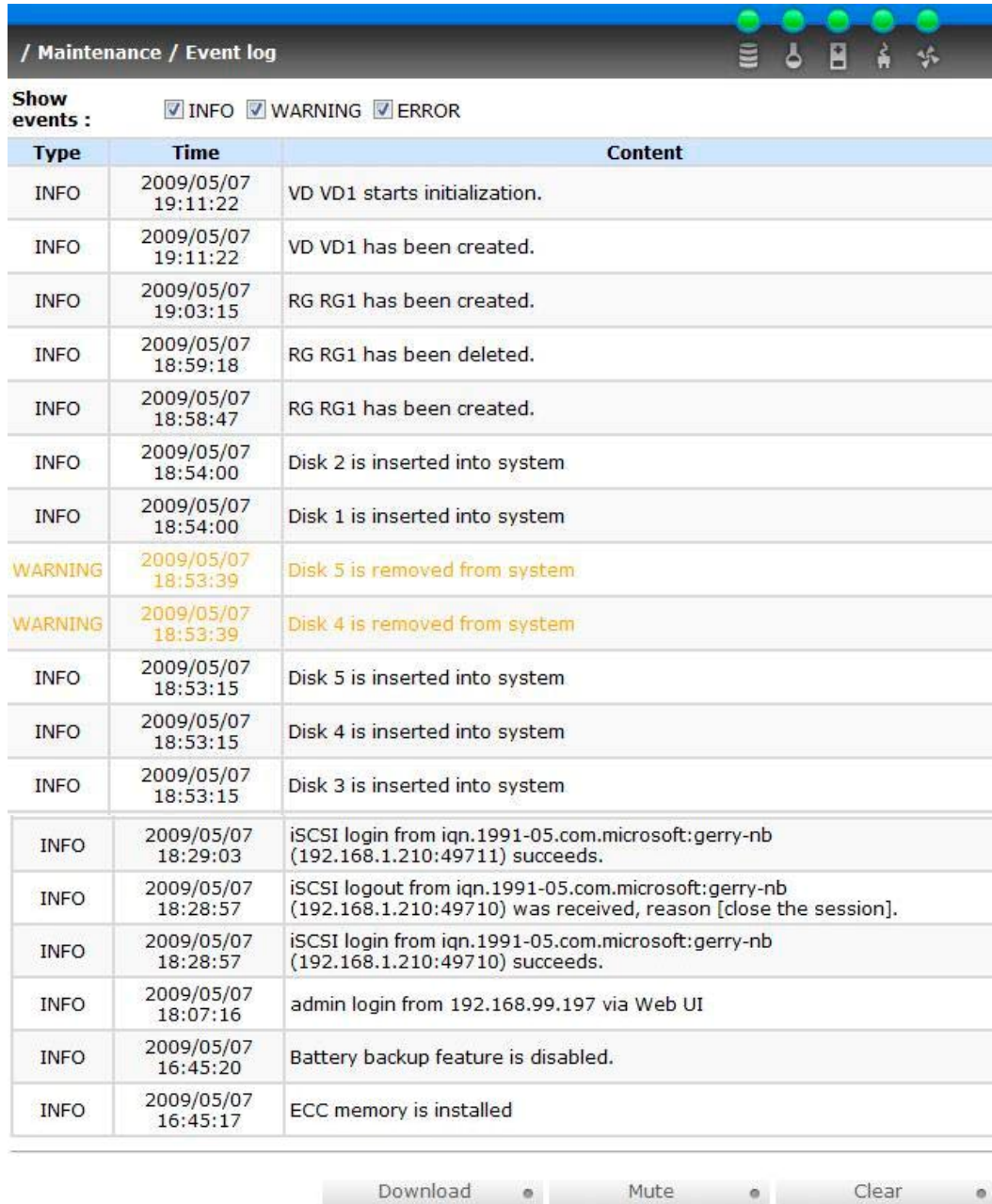
- **Import:** Imports all system configurations excluding volume configuration.
- **Export:** Exports all configurations to a file.



WARNING: “Import” will import all system configurations excluding volume configuration; the existing configurations will be replaced.

3.8.5 Event Log

Use **“Event log”** to view the system event messages. Check the INFO, WARNING, and ERROR checkboxes to choose the level of event log to display. Clicking **“Download”** button will save the whole event log as a text file with file name “log-ModelName-Date-Time.txt” (e.g., log-DP-504-G1A3-20090507-190659.txt). Click **“Clear”** button will clear event log. Click **“Mute”** button will stop alarm if system alerts.



Show events : ☒ INFO ☒ WARNING ☒ ERROR

Type	Time	Content
INFO	2009/05/07 19:11:22	VD VD1 starts initialization.
INFO	2009/05/07 19:11:22	VD VD1 has been created.
INFO	2009/05/07 19:03:15	RG RG1 has been created.
INFO	2009/05/07 18:59:18	RG RG1 has been deleted.
INFO	2009/05/07 18:58:47	RG RG1 has been created.
INFO	2009/05/07 18:54:00	Disk 2 is inserted into system
INFO	2009/05/07 18:54:00	Disk 1 is inserted into system
WARNING	2009/05/07 18:53:39	Disk 5 is removed from system
WARNING	2009/05/07 18:53:39	Disk 4 is removed from system
INFO	2009/05/07 18:53:15	Disk 5 is inserted into system
INFO	2009/05/07 18:53:15	Disk 4 is inserted into system
INFO	2009/05/07 18:53:15	Disk 3 is inserted into system
INFO	2009/05/07 18:29:03	iSCSI login from iqn.1991-05.com.microsoft:gerry-nb (192.168.1.210:49711) succeeds.
INFO	2009/05/07 18:28:57	iSCSI logout from iqn.1991-05.com.microsoft:gerry-nb (192.168.1.210:49710) was received, reason [close the session].
INFO	2009/05/07 18:28:57	iSCSI login from iqn.1991-05.com.microsoft:gerry-nb (192.168.1.210:49710) succeeds.
INFO	2009/05/07 18:07:16	admin login from 192.168.99.197 via Web UI
INFO	2009/05/07 16:45:20	Battery backup feature is disabled.
INFO	2009/05/07 16:45:17	ECC memory is installed

Download • Mute • Clear •

The event log is displayed in reverse order which means the latest event log is on the first page. The event logs are actually saved in the first four hard drives; each hard drive has one copy of event log. For one controller, there are four copies of event logs to make sure users can check event log any time when there is/are failed disk(s).

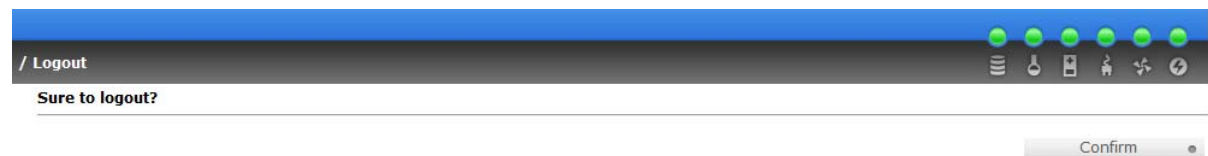
3.8.6 Reboot and Shutdown

“Reboot and shutdown” displays **“Reboot”** and **“Shutdown”** buttons. Before power off, it is better to execute **“Shutdown”** to flush the data from cache to physical disks. The step is necessary for data protection.



3.9 Logout

For security reason, **“Logout”** function will allow user to logout when it is not necessary to operate the system. To re-login the system, enter username and password again.



Chapter 4 Advanced Operation

4.1 Rebuild

If one physical disk of a Raid Group, which is set to a protected RAID level (e.g.: RAID 3, RAID 5, or RAID 6), is FAILED or has been unplugged/removed, the RG status is changed to degraded mode. The system will search/detect spare disk to **rebuild** the degraded RG to a complete one. It will try to detect dedicated spare disk first, then global spare disk, to rebuild.

The iSCSI RAID subsystem supports Auto-Rebuild function. The following is the scenario:

Take RAID 6 for example:

1. When there is no global spare disk or dedicated spare disk on the system, the subsystem will be in degraded mode and wait until (A) there is one disk assigned as spare disk, or (B) the failed disk is removed and replaced with new clean disk, then the Auto-Rebuild starts. The new disk will be a spare disk to the original RG automatically.
 - a. If the new added disk is not clean (with other RG information), it would be marked as RS (reserved) and the system will not start "auto-rebuild".
 - b. If this disk is not belonging to any existing RG, it would be FR (Free) disk and the system will start Auto-Rebuild function.
 - c. If user only removes the failed disk and plugs the same failed disk in the same slot again, the auto-rebuild will start by this case. But rebuilding in the same failed disk may impact customer data later if the disk status is unstable. It is not recommended to rebuild on the same failed disk for better data protection.
2. When there is enough global spare disk(s) or dedicated spare disk(s) for the degraded array, the subsystem starts Auto-Rebuild immediately. And in RAID 6, if there is another disk failure happening during the time of rebuilding, the subsystem will start the above Auto-Rebuild scenario as well. Auto-Rebuild feature only works when the status of RG is "**Online**". It will not work at "**Offline**" status. Thus, it will not conflict with the "Roaming" function.
3. In degraded mode, the status of RG is "**Degraded**". When rebuilding, the status of RG/VD will be "**Rebuild**", the column "**R%**" in VD will display the ratio in percentage. After complete rebuilding, the status will become "Online". RG will become complete.



NOTE: "Set dedicated spare" is not available if there is no RG or RAID level is 0 or JBOD, because dedicated spare disk can not be set to RAID 0 & JBOD.

Sometimes, rebuild is called recover; these two have the same meaning. The following table is the relationship between RAID levels and rebuild.

RAID 0	Disk striping. No protection for data. RG fails if any hard drive fails or unplugs.
RAID 1	Disk mirroring over 2 disks. RAID 1 allows one hard drive fails or unplugging. Need one new hard drive to insert to the system and rebuild to be completed.
N-way mirror	Extension to RAID 1 level. It has N copies of the disk. N-way mirror allows N-1 hard drives failure or unplugging.
RAID 3	Striping with parity on the dedicated disk. RAID 3 allows one hard drive failure or unplugging.
RAID 5	Striping with interspersed parity over the member disks. RAID 5 allows one hard drive failure or unplugging.
RAID 6	2-dimensional parity protection over the member disks. RAID 6 allows two hard drives failure or unplugging. If it needs to rebuild two hard drives at the same time, it will rebuild the first one, then the other in sequence.
RAID 0+1	Mirroring of RAID 0 volumes. RAID 0+1 allows two hard drive failures or unplugging, but at the same array.
RAID 10	Striping over the member of RAID 1 volumes. RAID 10 allows two hard drive failure or unplugging, but in different arrays.
JBOD	The abbreviation of “ J ust a B unch O f D isks”. No data protection. RG fails if any hard drive failures or unplugs.

4.2 RG Migration

To migrate the RAID level, please follow below procedures.

1. Select “/ **Volume configuration / RAID group**”.
2. Move the mouse pointer to the gray button next to the RG number; click “**Migrate**”.

No.	Name	Total (GB)	Free (GB)	#PD	#VD	Status	Health	RAID
1	RG1-R0->R5	2793	0	3	1	Online	Good	RAID 0

► Migrate

Activate

Deactivate

Scrub

Delete

Set disk property

More information

Create

3. Change the RAID level by clicking the down arrow to “**RAID 5**”. There will be a pup-up which indicates that HDD is not enough to support the new setting of RAID level, click “**Select PD**” to increase hard drives, then click “**Confirm**” to go back to setup page. When doing migration to lower RAID level, such as the original RAID level is RAID 6 and user wants to migrate to RAID 0, system will evaluate whether this operation is safe or not, and appear a message of “**Sure to migrate to a lower protection array?**” to give user warning.

Name : RG1-R0->R5

RAID level : RAID 5 ▼

RAID PD slot : 1 2 3

Select PD

<< Back Next >>

4. Double check the setting of RAID level and RAID PD slot. If there is no problem, click “**Next**”.
5. Finally a confirmation page shows the detail of RAID information. If there is no problem, click “**Confirm**” to start migration. System also pops up a message of “**Warning: power lost during migration may cause damage of data!**” to give user warning. When the power is abnormally off during the migration, the data is in high risk.

RG name : RG1-R0->R5

RAID level : RAID 0

RAID cell : 1

RAID PD slot : 1 2 3

Migrate to : RG1-R0->R5

RAID 5

1

1 2 3

<< Back Confirm



Sure to migrate?

Warning: power lost during migration may cause damage of data!

OK

Cancel

6. Migration starts and it can be seen from the **“status”** of a RG with **“Migrating”**. In **“/ Volume configuration / Virtual disk”**, it displays a **“Migrating”** in **“Status”** and complete percentage of migration in **“R %”**.

/ Volume configuration / RAID group									
No.	Name	Total (GB)	Free (GB)	#PD	#VD	Status	Health	RAID	
1	RG1-R0->R5	2793	0	4	1	Migrating	Good	RAID 5	

/ Volume configuration / Virtual disk											
No.	Name	Size (GB)	Right	Priority	Bg rate	Status	Health	R %	RAID	#LUN	RG name
1	VD1	2793	WB	HI	4	Migrating	Optimal	0	RAID 5	0	RG1-R0->R5

To do migration, the total size of RG must be larger or equal to the original RG. It does not allow expanding the same RAID level with the same hard disks of original RG. The operation is not allowed when RG is being migrated. System would reject the following operations:

1. Add dedicated spare.
2. Remove a dedicated spare.
3. Create a new VD.
4. Delete a VD.
5. Extend a VD.
6. Scrub a VD.
7. Perform yet another migration operation.
8. Scrub entire RG.



WARNING! RG Migration cannot be executed during rebuild or VD extension.

4.3 VD Extension

To extend VD size, please follow the procedures.

1. Select “/ Volume configuration / Virtual disk”.
2. Move the mouse pointer to the gray button next to the VD number; click “**Extend**”.

/ Volume configuration / Virtual disk / Extend

Size : 1862

Free : 931 (GB)

3. Change the size. The size must be larger than the original, and then click “**Confirm**” to start extension.

/ Volume configuration / Virtual disk / Extend

Size : 2793

Free : 931 (GB)

4. Extension starts. If VD needs initialization, it will display “**Initiating**” in “**Status**” and the completed percentage of initialization in “**R %**”.

No.	Name	Size (GB)	Right	Priority	Bg rate	Status	Health	R %	RAID	#LUN	RG name
1	VD1	2793	WB	HI	4	Initiating	Optimal	6	RAID 5	0	RG1-R0->R5



NOTE: The size of to-be-extended VD must be larger than the original.



WARNING! VD Extension cannot be executed during rebuild or migration.

4.5 Disk Roaming

Physical disks can be re-sequenced in the same system or move all physical disks from system-1 to system-2. This is called disk roaming. System can execute disk roaming online. Please follow the procedures.

1. Select “/ **Volume configuration / RAID group**”.
2. Move the mouse pointer to the gray button next to the RG number then click “**Deactivate**”.
3. Move all PDs related to the RG to another system.
4. Move the mouse pointer to the gray button next to the RG number then click “**Activate**”.
5. Done. The RG has roamed to another system.

Disk roaming has some constraints as described in the following:

1. Check the firmware of two systems first. It is better that both systems have the same firmware version or newer.
2. All physical disks of related RG should be moved from system-1 to system-2 together. The configuration of both RG and VD will be kept but LUN configuration will be cleared in order to avoid conflict with system-2.

4.6 Support Microsoft MPIO and MC/S

MPIO (Multi-Path Input/Output) and **MC/S** (Multiple Connections per Session) use multiple physical paths to create logical "paths" between the server and the storage device. In the case one or more of these components fails, causing the path to fail, multi-path logic uses an alternate path for I/O. So applications can still access their data.

Microsoft iSCSI initiator supports multi-path function. Please follow the procedures to use MPIO feature.

1. A host with dual LAN ports connects cables to the subsystem.
2. Create a RG/VD and attach this VD to the host.
3. When installing “**Microsoft iSCSI initiator**”, please install MPIO driver at the same time.
4. Logon to target separately on each port. When logon to target, check “Enable multi-path”.
5. MPIO mode can be selected on Targets → Details → Devices → Advanced in Microsoft iSCSI initiator.
6. Rescan disk.
7. There will be one disk running MPIO.

Appendix

A. Certification List

RAM

RAM Spec: 184pins, DDR333(PC2700), Reg.(register) or UB(Unbuffered), ECC or Non-ECC, from 64MB to 1GB, 32-bit or 64-bit data bus width, x8 or x16 devices, 9 to 11 bits column address.

Vendor	Model
ATP	AG64L72T8SQC4S, 512MB DDR-400 (ECC) with Samsung
ATP	AG28L64T8SHC4S, 1GB DDR-400 with Samsung
ATP	AG28L72T8SHC4S, 1GB DDR-400 (ECC) with Samsung
ATP	AB28L72Q8SHC4S, 1GB DDR-400 (ECC, Reg.) with Samsung
Unigen	UG732D6688KN-DH, 256MB DDR-333 (Unbuffered) with Hynix
Unigen	UG732D7588KZ-DH, 256MB DDR-333 (ECC, Reg.) with Elpida
Unigen	UG764D7588KZ-DH, 512MB DDR-333 (ECC, Reg.) with Elpida
Unigen	UG7128D7588LZ-DH, 1GB DDR-333 (ECC, Reg.) with Hynix
Unigen	UG7128D7488LN-GJF, 1GB DDR-400 (ECC) with Hynix
Unigen	UG7128D7588LZ-GJF, 1GB DDR-400 (ECC, Reg.) with Hynix
Unigen	UG7128D7588LZ-GJF, 1GB DDR-400 (ECC, Reg.) with Elpida
Unigen	UG732D6688KS-DH, 256MB DDR-333 (Unbuffered, Low profile) with Hynix
Unigen	UG764D6688LS-DH, 512MB DDR-333 (Unbuffered, Low profile) with Hynix
Unigen	UG718D6688LN-GJF, 1GB DDR-400 with Hynix
Unigen	UG718D6688LN-GJF, 1GB DDR-400 with Elpida

iSCSI Initiator (Software)

OS	Software / Release Number
Microsoft Windows	Microsoft iSCSI Software Initiator Release v2.07 System Requirements: 1. Windows 2000 Server with SP4 2. Windows Server 2003 with SP2 3. Windows Server 2003 R2 with SP2 4. Windows Server 2008
Linux	The iSCSI Initiators are different for different Linux Kernels. 1. For Red Hat Enterprise Linux 3 (Kernel 2.4), install linux-iscsi-3.6.3.tar 2. For Red Hat Enterprise Linux 4 (Kernel 2.6), use the

	build-in iSCSI initiator iscsi-initiator-utils-4.0.3.0-4 in kernel 2.6.9 3. For Red Hat Enterprise Linux 5 (Kernel 2.6), use the build-in iSCSI initiator iscsi-initiator-utils-6.2.0.742-0.5.el5 in kernel 2.6.18
Mac	ATTO Xtend SAN iSCSI initiator v3.10 System Requirements: 1. Mac OS X v10.5 or later

For ATTO Xtend SAN iSCSI initiator, it is not free. Please contact your local distributor.

iSCSI HBA card

Vendor	Model
HP	NC380T (PCI-Express, Gigabit, 2 ports, TCP/IP offload, iSCSI offload)
QLogic	QLA4010C (PCI-X, Gigabit, 1 port, TCP/IP offload, iSCSI offload)
QLogic	QLA4052C (PCI-X, Gigabit, 2 ports, TCP/IP offload, iSCSI offload)

NIC

Vendor	Model
HP	NC7170 (PCI-X, Gigabit, 2 ports)
HP	NC360T (PCI-Express, Gigabit, 2 ports, TCP/IP offload)
IBM	NetXtreme 1000 T (73P4201) (PCI-X, Gigabit, 2 ports, TCP/IP offload)
Intel	PWLA8492MT (PCI-X, Gigabit, 2 ports, TCP/IP offload)

GbE Switch

Vendor	Model
Dell	PowerConnect 5324
Dell	PowerConnect 2724
Dell	PowerConnect 2708
HP	ProCurve 1800-24G

Hard drive

Vendor	Model
Hitachi	Deskstar 7K250, HDS722580VLSA80, 80GB, 7200RPM, SATA, 8M
Hitachi	Deskstar E7K500, HDS725050KLA360, 500GB, 7200RPM, SATA II, 16M
Hitachi	Deskstar 7K80, HDS728040PLA320, 40GB, 7200RPM, SATA II, 2M
Hitachi	Deskstar T7K500, HDT725032VLA360, 320GB, 7200RPM, SATA II, 16M
Hitachi	Deskstar P7K500, HDP725050GLA360, 500GB, 7200RPM, SATA II, 16M
Maxtor	DiamondMax Plus 9, 6Y080M0, 80GB, 7200RPM, SATA, 8M
Maxtor	DiamondMax 11, 6H500F0, 500GB, 7200RPM, SATA 3.0Gb/s, 16M
Samsung	SpinPoint P80, HDSASP0812C, 80GB, 7200RPM, SATA, 8M
Seagate	Barracuda 7200.7, ST380013AS, 80GB, 7200RPM, SATA 1.5Gb/s, 8M
Seagate	Barracuda 7200.7, ST380817AS, 80GB, 7200RPM, SATA 1.5Gb/s, 8M, NCQ
Seagate	Barracuda 7200.8, ST3400832AS, 400GB, 7200RPM, SATA 1.5Gb/s, 8M, NCQ
Seagate	Barracuda 7200.9, ST3500641AS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M, NCQ
Seagate	Barracuda 7200.11, ST31000340AS, 1000GB, 7200RPM, SATA 3.0Gb/s, 32M, NCQ
Seagate	NL35, ST3400633NS, 400GB, 7200RPM, SATA 3.0Gb/s, 16M
Seagate	NL35, ST3500641NS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M
Seagate	Barracuda ES, ST3500630NS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M
Seagate	Barracuda ES, ST3750640NS, 750GB, 7200RPM, SATA 3.0Gb/s, 16M
Seagate	Barracuda ES.2, ST31000340NS, 1000GB, 7200RPM, SATA 3.0Gb/s, 32M
Western Digital	Caviar SE, WD800JD, 80GB, 7200RPM, SATA 3.0Gb/s, 8M
Western Digital	Caviar SE, WD1600JD, 160GB, 7200RPM, SATA 1.5Gb/s, 8M
Western Digital	Raptor, WD360GD, 36.7GB, 10000RPM, SATA 1.5Gb/s, 8M
Western Digital	Caviar RE2, WD4000YR, 400GB, 7200RPM, SATA 1.5Gb/s, 16M, NCQ
Western Digital	RE2, WD4000YS, 400GB, 7200RPM, SATA 3.0Gb/s, 16M
Western Digital	Caviar RE16, WD5000AAKS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M
Western Digital	RE2, WD5000ABYS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M, NCQ

B. Event Notifications

- PD events

Level	Type	Description
INFO	Disk inserted	Disk <slot> is inserted into system.
WARNING	Disk removed	Disk <slot> is removed from system.
ERROR	HDD failure	Disk <slot> is disabled.

- HW events

Level	Type	Description
WARNING	ECC error	Single-bit ECC error is detected.
ERROR	ECC error	Multi-bit ECC error is detected.
INFO	ECC info	ECC memory is installed.
INFO	ECC info	Non-ECC memory is installed.
INFO	SCSI info	Received SCSI Bus Reset event at the SCSI Bus <number>.

- EMS events

Level	Type	Description
INFO	Power installed	Power <number> is installed.
ERROR	Power absent	Power <number> is absent.
INFO	Power work	Power <number> is restored to work.
ERROR	Power warning	Power <number> is out of work.
WARNING	Power detect	PSU signal detection <number>.
INFO	Fan work	Fan <number> is restored to work.
ERROR	Fan warning	Fan <number> is out of work.
INFO	Fan installed	Fan <number> is installed.
ERROR	Fan not present	Fan <number> is not present.
WARNING	Thermal warning	System temperature <location> is a little bit higher.
ERROR	Thermal critical	System Overheated <location>!!!
ERROR	Thermal critical shutdown	System Overheated <location>!!! The system will do the auto shutdown immediately.
WARNING	Thermal ignore value	Unable to update thermal value on <location>.
WARNING	Voltage warning	System voltage <location> is a little bit higher/lower.
ERROR	Voltage critical	System voltages <location> failed!!!
ERROR	Voltage critical shutdown	System voltages <location> failed!!! The system will do the auto shutdown immediately.
INFO	UPS info	UPS detection succeeded.
WARNING	UPS error	UPS detection failed.
ERROR	UPS error	AC loss for the system is detected.
ERROR	UPS error	UPS Power Low!!! The system will do the

		auto shutdown immediately.
WARNING	SMART T.E.C.	Disk <slot> S.M.A.R.T. Threshold Exceed Condition occurred for attribute <item>.
WARNING	SMART failure	Disk <slot>: Failure to get S.M.A.R.T information.

- RMS events**

Level	Type	Description
INFO	Console Login	<username> login from <IP or serial console> via Console UI.
INFO	Console Logout	<username> logout from <IP or serial console> via Console UI.
INFO	Web Login	<username> login from <IP> via Web UI.
INFO	Web Logout	<username> logout from <IP> via Web UI.

- LVM3 events**

Level	Type	Description
INFO	RG created	RG <name> has been created.
INFO	RG creation failed	Failed to create RG <name>.
INFO	RG deleted	RG <name> has been deleted.
INFO	VD created	VD <name> has been created.
INFO	VD creation failed	Failed to create VD <name>.
INFO	VD deleted	VD <name> has been deleted.
INFO	VD renamed	Name of VD <name> has been renamed to <name>.
INFO	Read-only caching enabled	Cache policy of VD <name> has been set as read only.
INFO	Writeback caching enabled	Cache policy of VD <name> has been set as write-back.
INFO	Write-through caching enabled	Cache policy of VD <name> has been set as write-through.
INFO	VD extended	Size of VD <name> extends.
INFO	VD initialization started	VD <name> starts initialization.
INFO	VD initialization finished	VD <name> completes the initialization.
WARNING	VD initialization failed	Failed to complete initialization of VD <name>.
INFO	VD rebuild started	VD <name> starts rebuilding.
INFO	VD rebuild finished	VD <name> completes rebuilding.
WARNING	VD rebuild failed	Failed to complete rebuild of VD <name>.
INFO	VD migration	VD <name> starts migration.

	started	
INFO	VD migration finished	VD <name> completes migration.
ERROR	VD migration failed	Failed to complete migration of VD <name>.
INFO	VD scrubbing started	VD <name> starts scrubbing.
INFO	VD scrubbing finished	VD <name> completes scrubbing.
INFO	RG migration started	RG <name> starts migration.
INFO	RG migration finished	RG <name> completes migration.
INFO	RG activated	RG <name> has been manually activated.
INFO	RG deactivated	RG <name> has been manually deactivated.
INFO	VD rewrite started	Rewrite at LBA <address> of VD %s starts.
INFO	VD rewrite finished	Rewrite at LBA <address> of VD %s completes.
WARNING	VD rewrite failed	Rewrite at LBA <address> of VD %s failed.
WARNING	RG degraded	RG <name> is under degraded mode.
WARNING	VD degraded	VD <name> is under degraded mode.
ERROR	RG failed	RG <name> is failed.
ERROR	VD failed	VD <name> is failed.
WARNING	Recoverable read error occurred	Recoverable read error occurred at LBA <address>-<address> of VD <name>.
WARNING	Recoverable write error occurred	Recoverable write error occurred at LBA <address>-<address> of VD <name>.
ERROR	Unrecoverable read error occurred	Unrecoverable read error occurred at LBA <address>-<address> of VD <name>.
ERROR	Unrecoverable write error occurred	Unrecoverable write error occurred at LBA <address>-<address> of VD <name>.
INFO	Dedicated spare configured	PD <slot> has been configured to RG <name> as a dedicated spare disk.
INFO	Global spare configured	PD <slot> has been configured as a global spare disk.
WARNING	PD read error occurred	Read error occurred at LBA <address>-<address> of PD <slot>.
WARNING	PD write error occurred	Write error occurred at LBA <address>-<address> of PD <slot>.
WARNING	Parity wrong when scrubbing	The parity data is wrong at LBA <address>-<address> when scrubbing VD <name>.
WARNING	Data recovered when scrubbing	Data at LBA <address>-<address> has been recovered when scrubbing VD <name>.
INFO	PD freed	PD <slot> has been removed from RG <name>.
INFO	RG imported	Configuration of RG<name> has been

		imported.
INFO	RG restored	Configuration of RG <name> has been restored.
INFO	VD restored	Configuration of VD <name> has been restored.

- iSCSI events**

Level	Type	Description
INFO	iSCSI login succeeds	iSCSI login from <IP> succeeds.
INFO	iSCSI login rejected	iSCSI login from <IP> was rejected, reason [<string>]
INFO	iSCSI logout	iSCSI logout from <IP> was received, reason [<string>].

- Battery backup events**

Level	Type	Description
INFO	BBM sync data	Abnormal shutdown detected, start flushing battery-backed data (<number> KB).
INFO	BBM sync data	Abnormal shutdown detected, flushing battery-backed data finishes.
INFO	BBM detected	Battery backup module is detected.
INFO	BBM is good	Battery backup module is good.
INFO	BBM is charging	Battery backup module is charging.
WARNING	BBM is failed	Battery backup module is failed.
INFO	BBM	Battery backup feature is <item>.

- JBOD events**

Level	Type	Description
INFO	Disk inserted	JBOD <number> disk <slot> is inserted into system.
Warning	Disk removed	JBOD <number> disk <slot> is removed from system.
ERROR	HDD failure	JBOD <number> disk <slot> is disabled.
INFO	JBOD inserted	JBOD <number> is inserted into system
WARNING	JBOD removed	JBOD <number> is removed from system
WARNING	SMART T.E.C	JBOD <number> disk <slot>: S.M.A.R.T. Threshold Exceed Condition occurred for attribute %s
WARNING	SMART Failure	JBOD <number> disk <slot>: Failure to get S.M.A.R.T information
INFO	Dedicated spare configured	JBOD <number> PD <slot> has been configured to RG <name> as a dedicated spare disk.
INFO	Global spare configured	JBOD <number> PD <slot>d has been configured as a global spare disk.
WARNING	PD read error	Read error occurred at LBA <address>-

	occurred	<address> of JBOD <number> PD <slot>.
WARNING	PD write error occurred	Write error occurred at LBA <address> - <address> of JBOD <number> PD <slot>.
INFO	PD freed	JBOD <number> PD <slot> has been removed from RG <name>.

- **System maintenance events**

Level	Type	Description
INFO	System shutdown	System shutdown.
INFO	System reboot	System reboot.
INFO	FW upgrade start	Firmware upgrade start.
INFO	FW upgrade success	Firmware upgrade success.
WARNING	FW upgrade failure	Firmware upgrade failure.

C. Known Issues

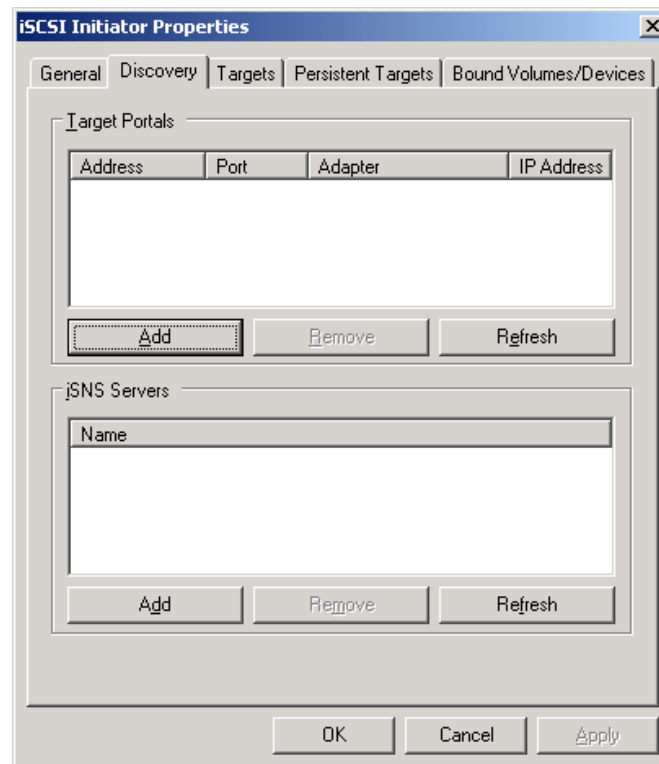
1. Microsoft MPIO is not supported on Windows XP or Windows 2000 Professional.

Workaround solution: Using Windows Server 2003 or Windows 2000 Server to run MPIO.

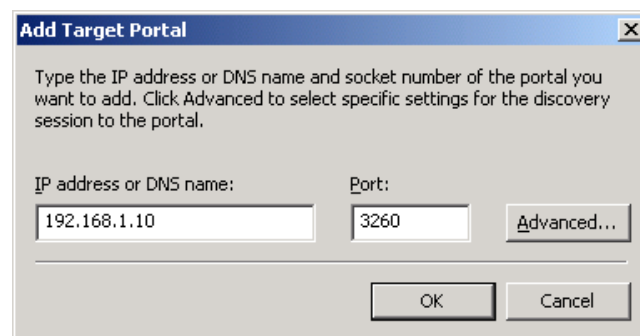
D. Microsoft iSCSI Initiator

Here are the steps to setup Microsoft iSCSI Initiator. Please visit Microsoft website for latest iSCSI initiator. The following setup may not use the latest Microsoft iSCSI initiator.

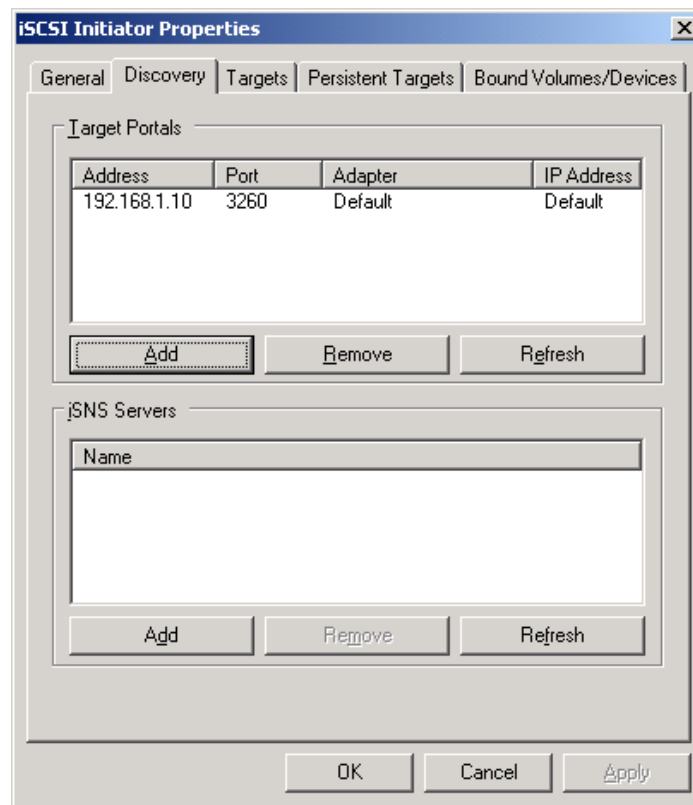
1. Run Microsoft iSCSI Initiator.
2. Click **“Discovery”**.



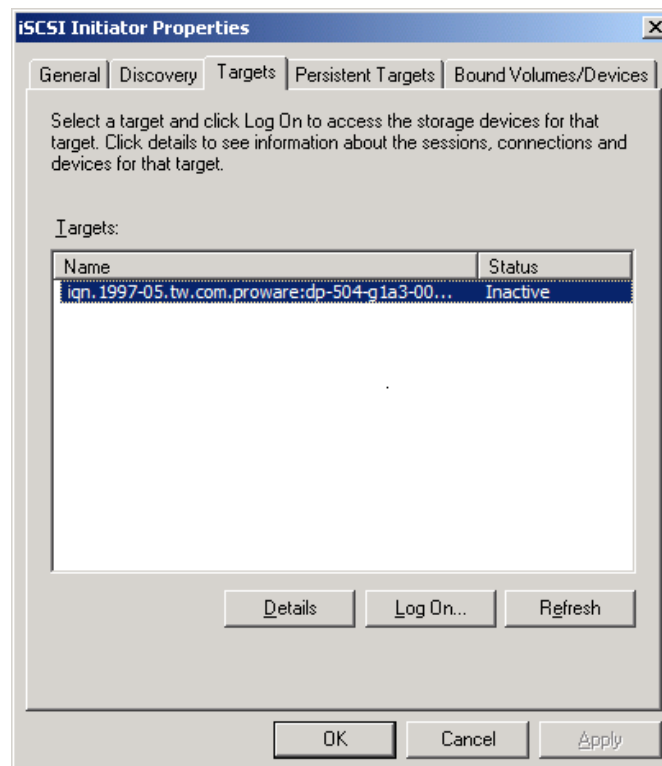
3. Click **“Add”**. Input IP address or DNS name of iSCSI storage device.



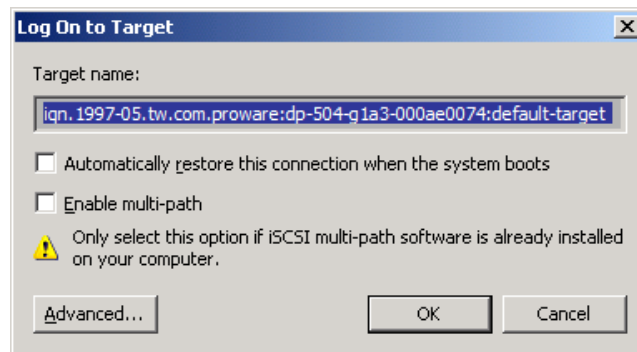
- Click **“OK”**.



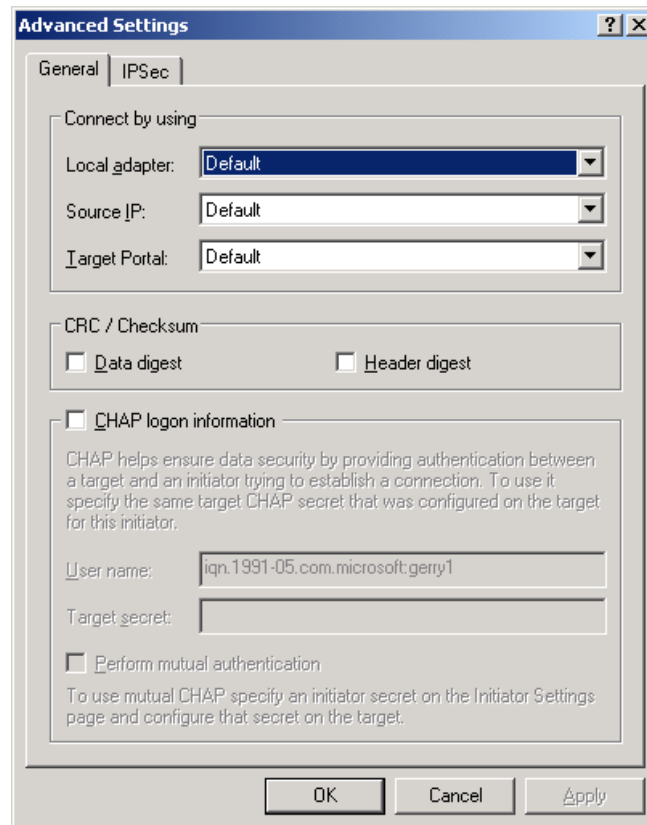
- Click **“Targets”**.



6. Click **“Log On”**. Check **“Enable multi-path”** if running MPIO.

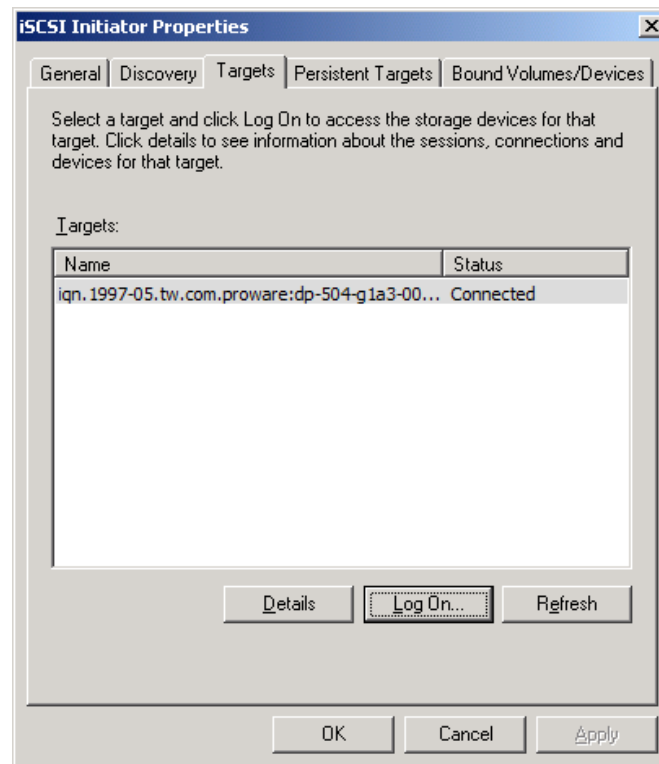


7. Click **“Advance”** if CHAP information is needed.



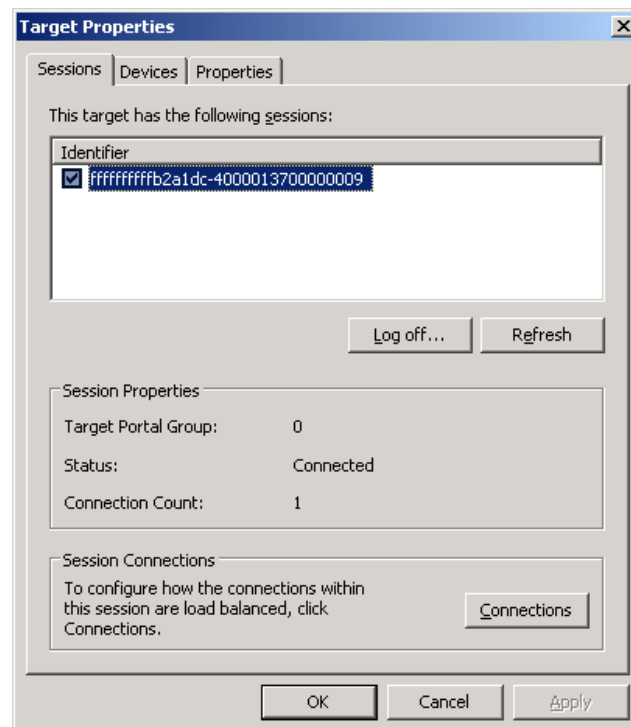
8. Click **“OK”**. The status would be “Connected”.

9. Done, it can connect to an iSCSI disk.



The following procedure is to log off iSCSI device.

- a. Click **"Details"**.



- b. Check the Identifier, which will be deleted.
- c. Click **“Log off”**.
- d. Done, the iSCSI device log off successfully.

E. Installation Steps for Large Volume (Over 2TB)

Introduction:

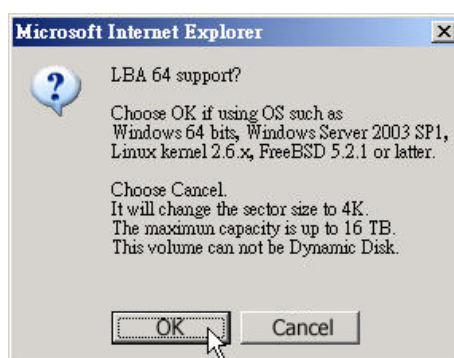
The iSCSI RAID subsystem is capable of supporting large volumes (>2TB). When connecting controllers to 64bit OS installed host/server, the host/server is inherently capable for large volumes from the 64bit address. On the other side, if the host/server is installed with 32bit OS, user has to change the block size to 1KB, 2KB or 4KB to support volumes up to 4TB, 8TB or 16TB, for the 32bit host/server is not LBA (Logical Block Addressing) 64bit supported. For detail installation steps, please refer to following steps below.

Step 1: Configure target

1. Prepare large capacity hard drivers where the RG/VD capacity will be over 2TB. Follow the steps in Chapter 3 to create a RG/VD. Then attach LUN.



NOTE: If the OS is 64bit, user can set the block size to any available value. If the OS is 32bit, user must change the block size to larger values than 512B. There will be a confirmation pop-up message when VD size is over 2TB.



Choose “OK” for 64bit OS, or choose “Cancel” for 32bit OS. This step will change block size to 4K automatically.

2. Move the mouse pointer to the gray button next to the VD number then click **“More information”**. Look at block size; 512B for 64bit OS setting, while 4K for 32bit OS setting.

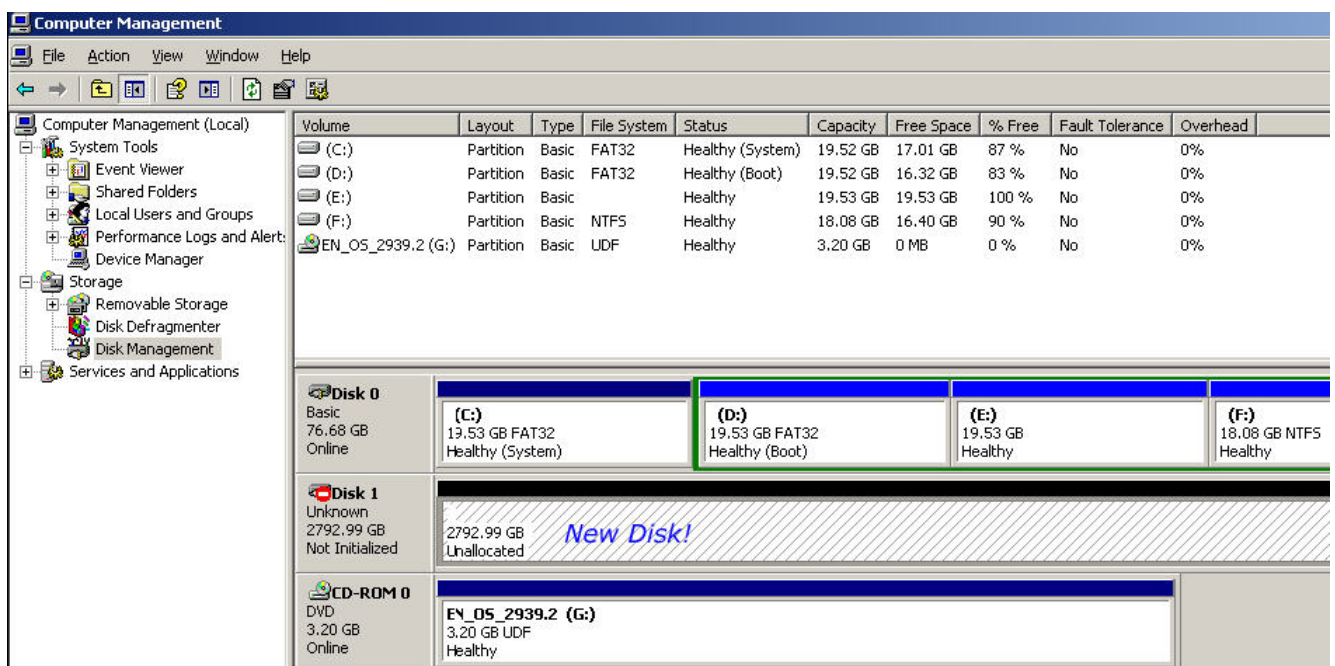
Step 2: Configure host/server

1. Follow the installation guild provided by HBA vendor, install HBA driver properly. For iSCSI models, please install the latest Microsoft iSCSI initiator from the link below.

<http://www.microsoft.com/downloads/details.aspx?FamilyID=12cb3c1a-15d6-4585-b385-befd1319f825&DisplayLang=en>

Step 3: Initialize/Format/Mount the disk

1. Go to Start → Control Panel → Computer Management → Disk Management, it displays a new disk.

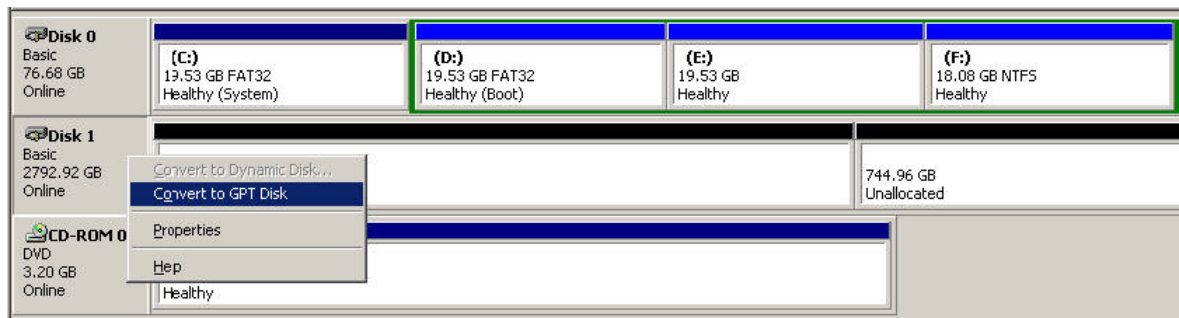


2. Initialize the disk.

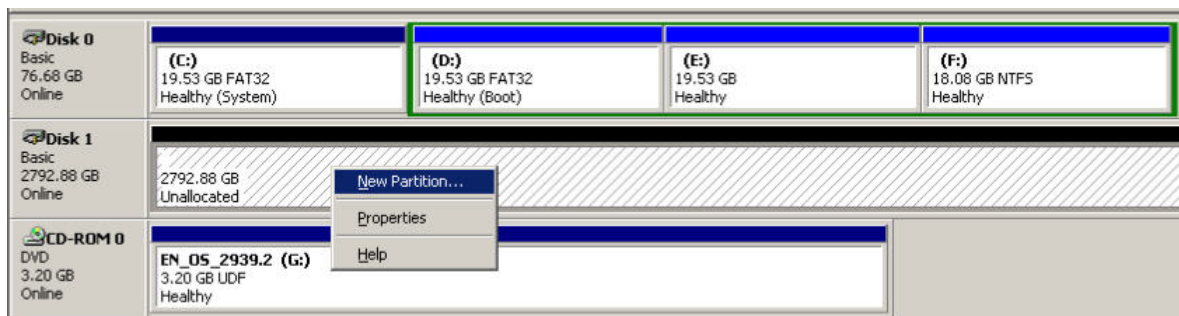


3. Convert to GPT disk for over 2TB capacity. For more detail information about GPT, please visit

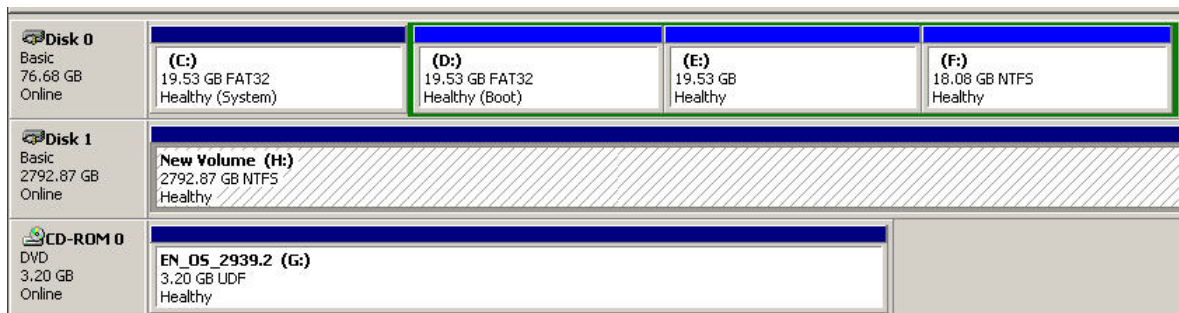
http://www.microsoft.com/whdc/device/storage/GPT_FAQ.mspx



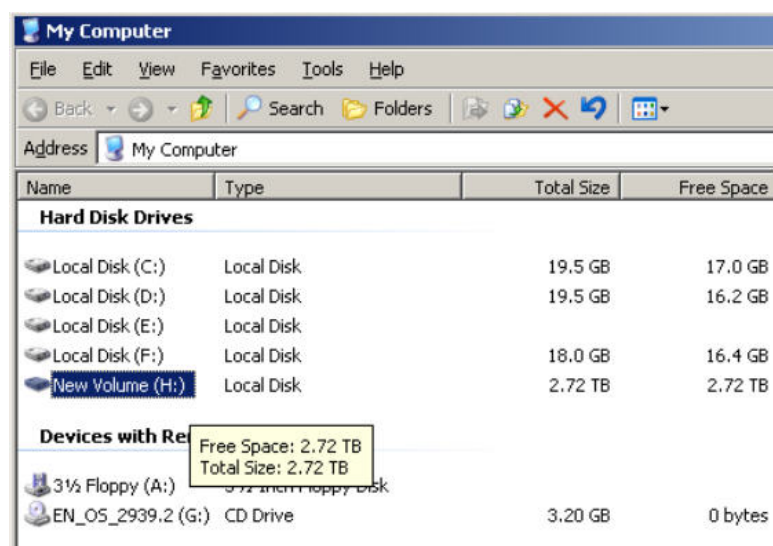
4. Format the disk.



5. Done.



6. The new disk is ready to use, the available size = 2.72TB.





WARNING: If user setups 512B block size for VD and the host/server OS is 32bit, in the last step of formatting disk, user will find OS cannot format the disk sector after 2048GB (2TB).

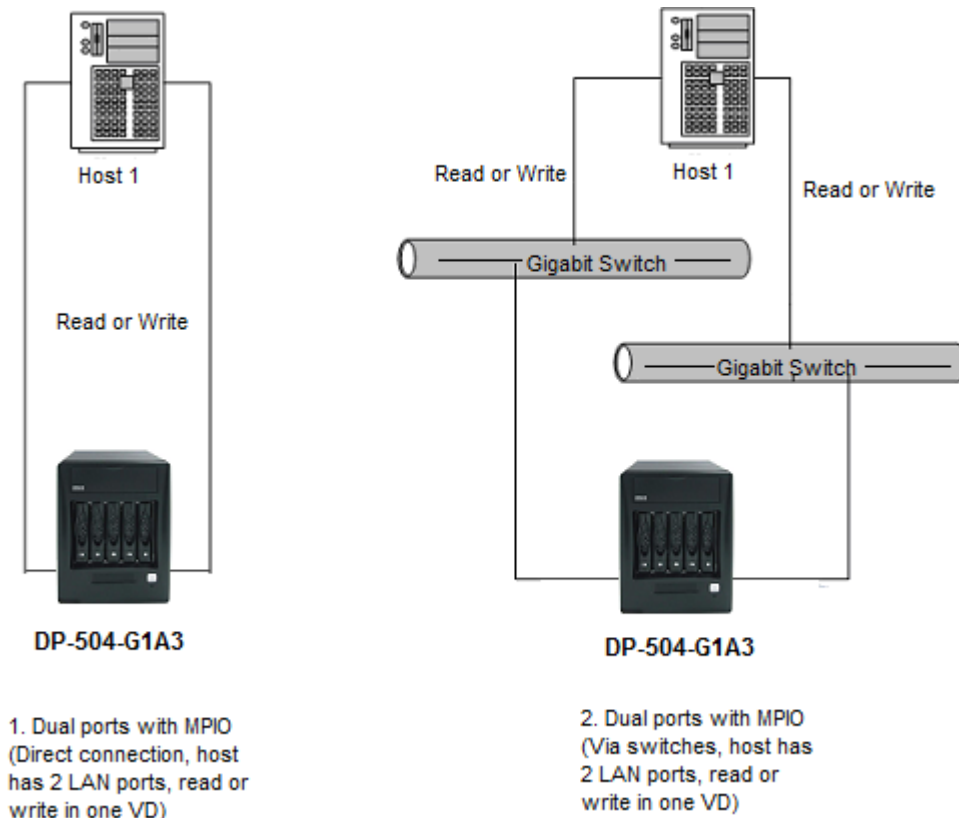
7. Wrong setting result: OS can not format disk sector after 2048GB(2TB).

Disk 0 Basic 76.68 GB Online	(C:) 19.53 GB FAT32 Healthy (System)	(D:) 19.53 GB FAT32 Healthy (Boot)	(E:) 19.53 GB Healthy	(F:) 18.08 GB NTFS Healthy
Disk 1 Basic 2792.99 GB Online	New Volume (H:) 2048.00 GB NTFS Healthy		744.99 GB Unallocated	
CD-ROM 0 DVD 3.20 GB Online	EN_OS_2939.2 (G:) 3.20 GB UDF Healthy		 <i>OS cannot format this area!</i>	

F. MPIO and MC/S Setup Instructions

Here is the instruction to setup MPIO. The following network diagrams are the examples. Please follow them to setup the environment. Remind that host must have multi NICs which are set up with different IPs

- Network diagram of MPIO.



The MPIO setup instructions are the following:

1. Create RG/VD, and then attach LUN.
2. Add the first "Target Portal" on Microsoft iSCSI initiator.
3. Add the second "Target Portal" on Microsoft iSCSI initiator.
4. Logon.
5. Enable **"Enable multi-path"** checkbox. Then click **"Advanced..."**.
6. Select the first "Source IP" and "Target Portal" to iSCSI data port 1. Then click **"OK"**.
7. Logon again.
8. Enable **"Enable multi-path"** checkbox. Then click **"Advanced..."**.
9. Select the second "Source IP" and "Target Portal" to iSCSI data port 2. Then click **"OK"**.
10. iSCSI device is connected. Click **"Details"**.
11. Click **"Device"** tab, then click **"Advanced"**.

12. Click **"MPIO"** tab, select **"Load Balance Policy"** to **"Round Robin"**.
13. Click **"Apply"**.
14. Run **"Device Manage"** in Windows. Make sure MPIO device is available.
15. Done.

The MC/S setup instructions are in the following:

1. Create RG/VD, and then attach LUN.
2. Add the first "Target Portal" on Microsoft iSCSI initiator, For MC/S, there is only ONE **"Target Portals"** in the **"Discovery"** tab.
3. Logon.
4. Then click **"Advanced..."**.
5. Select the first "Source IP" and "Target Portal" to iSCSI data port 1. Then click **"OK"**.
6. After connected, click **"Details"**, then in the **"Session"** tab, click **"Connections"**.
7. Choose **"Round Robin"** in **"Load Balance Policy"**.
8. **"Add"** Source Portal for the iSCSI data port 2.
9. Select the second "Source IP" and "Target Portal" to iSCSI data port 2. Then select **"OK"**.
10. Done.

System information

	iSCSI RAID Subsystem
SW version	1.0.2 Build 200812121700